End Semester Examination, May 2022
B. Tech. – Seventh Semester
EMERGING AUTOMOTIVE TECHNOLOGY (AU-817)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   a) Define hybrid electric vehicles.   [CO-3] [L-1]

      b) Explain globalization and regionalization in context to automotive industry.

                                                             [CO-1] [L-1]

      c) What is the use of actuators in the Automotive Industry?   [CO-6] [L-1]

      d) What is meant by the hydrogen storage system?   [CO-5] [L-2]

      e) Define the term brand management.   [CO-1] [L-1]

      f) Define integrated starter generator.   [CO-5] [L-1]

      g) What is Deep discharge?   [CO-5] [L-1]

      h) Enlist various resistances against vehicle motion.   [CO-3] [L-1]

      i) What is a fuel cell?   [CO-2] [L-1]

      j) What is the need for hybrid vehicles in today's era?   [CO-4] [L-1]

                                                                   2x10

PART-A

Q.2   Integrate the challenges for designing the 21st-century vehicle in detail. [CO-1] [L-4] **20**

Q.3   a) Categories the fuel cell based on electrolyte, operating temperature, and efficiency.

                                                     [CO-2] [L-4] **10**

      b) Select fuel cell systems that generate energy from other conventional sources, and through the electrolysis process, water split into oxygen and hydrogen fuel.

                                                     [CO-2] [L-6] **10**

Q.4   a) Evaluate the performance of the engine without a throttle butterfly valve.

                                                     [CO-3] [L-6] **10**

      b) Compare the function of cam less engine with standard engine.   [CO-3] [L-4] **10**

PART-B

Q.5   Select the best architecture of electric hybrid electric vehicle for low power requirement and explain with neat sketch.   [CO-4] [L-6] **20**

Q.6   Propose the energy storage system for large-scale energy storage in tiny portable devices.   [CO-5] [L-5] **20**

Q.7   a) Design a vehicle in which replaces an inaccurate mechanical system with a highly advanced and accurate method. Explain anyone with a neat sketch.

                                                     [CO-6] [L-5] **10**

      b) Examine the function of the constant variable transmission system and how it will be helpful for present vehicles.   [CO-6] [L-4] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
AERODYNAMICS (BAE-DS-401)

Time: 3 hrs. Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory***. Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B***. Marks are indicated against each question.*

Q.1 a) What is Aerodynamics? Briefly explain its importance for an aeronautical engineer.

[CO-1/L-3]

b) What are the essential attributes required to become an aero modeler? [CO-4/L-2]

c) What do you understand by potential flow? Briefly explain significance of Biot-Savart Law. [CO-4/L-2]

d) Analyse the subsonic flow characteristics of a delta wing to elucidate the lift and drag characteristics of a delta wing aircraft with small aspect ratio. [CO-5/L-3]]

e) List out the various forces and moments generated on an aircraft, explain importance of Navier Stokes equation. [CO-6/L-2] **4x5**

PART-A

Q.2 Classify various types of flow in relation to mach number, apply the concept for aerodynamic evaluation of flow conditions over an aerofoil. [CO-1][L-3] **20**

Q.3 With a brief description and analysis of the thin aerofoil theory, elucidate valid importance of Kutta Juokowsky theorem. [CO-2][L-4] **20**

Q.4 Giving an overview of Prandtl Lifting line theory, evaluate the affect of aspect ratio on wings. [CO-3][L-1] **20**

PART-B

Q.5 With suitable diagram and mathematical formulations, analyse the Kutta-Joukowski transformation of a circle into a straight line. [CO-4][L-3] **20**

Q.6 Air France 447, an Airbus A330 that crashed in 2009 after a host of electronic instrument failures confused the pilots about what the aircraft was actually doing. Although the nose of the aircraft was pointing down just slightly relative to the horizon, the aircraft was actually falling almost leaf-like. The resulting angle of attack was so great, the wing stopped flying and because the crew took the wrong actions, the aircraft simply fell 37,000 feet into the waters of the South Atlantic. Analyse this accident outlining the various issues involved in high altitude aerodynamics.

[CO-5][L-4] **20**

Q.7 Explain the phenomenon of boundary layer separation and the effect of pressure gradient with a suitable diagram. What is Blasius solution in reference to the skin friction coefficient and boundary layer thickness? [CO-6][L-5] **20**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
FLIGHT MECHANICS (BAE-DS-402)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer the following questions:
   a) State the importance of flight mechanics in aircraft design process.   [CO-1][L-1]
   b) Differentiate centre of pressure and aerodynamic centre.   [CO-1][L-2]
   c) How to reduce induced drag and interference drag?   [CO-2][L-2]
   d) Illustrate the conditions for minimum drag and minimum power.   [CO-3][L-2]
   e) Define 'range and endurance'.   [CO-2][L-2]
   f) Define 'balance field length'.   [CO-4][L-2]
   g) What is head wind and tail wind?   [CO-5][L-1]
   h) Define 'limit load and ultimate load'.   [CO-6][L-1]
   i) Define 'load factor'.   [CO-6][L-2]
   j) Define 'rate of climb'.   [CO-5][L-2] **2x10**

PART-A

Q.2   a) What is international standard atmosphere. Analyze density ratio and temperature ratio in an isothermal and gradient layer of atmosphere.   [CO-1][L-4] **10**
   b) Defining drag elucidate its constituents and classify different types of drag.   [CO-1][L-1] **10**

Q.3   a) With appropriate notations and diagram, derive equations of motion of an Aircraft in a steady level flight.   [CO-2] [L-3] **10**
   b) What is thrust required? Plot a thrust required curve and explain its significance in flight mechanics.   [CO-2] [L-3] **10**

Q.4   a) Analyse the equations of motion of a steady climbing flight of an aircraft. Also estimate the maximum climb angle and rate of climb using analytical approach?
   [CO-3] [L-4] **20**

PART-B

Q.5   a) Mathematically formulate the expressions for Range and Endurance for a Jet engine driven aircraft.   [CO-4] [L-3] **12**
   b) Explain as to how Head and Tail Wind will effect the performance of an Aircraft.
   [CO-4] [L-3] **8**

Q.6   a) With the help of a neat diagram explain the different phases of Take-Off of an Aircraft.   [CO-5] [L-3] **10**
   b) Estimate the Ground Roll distance of an aircraft using neat sketches.
   [CO-5] [L-3] **10**

Q.7   a) Plot V-n Diagram for a Civil Transport aircraft and explain its Significance.
   [CO-6] [L-4] **12**
   b) Write a Short note on Turning Performance of an Aircraft.   [CO-6] [L-3] **8**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
AIRCRAFT PROPULSION (BAE-DS-403)

Time: 3 hr   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer the following in briefly:
   a) How does the speed of air vary at the tip of propeller blade as well as at the hub of the propeller?   [CO-1] [L-3]
   b) What do you understand by Propulsion? Briefly explain the essential characteristics of an efficient propulsion system.   [CO-2] [L-2]
   c) Differentiate between performance of constant pitch and variable pitch propeller. Explain with Performance v/s Airspeed Graph.   [CO-4] [L-5]
   d) With a line diagram, mark important parts of a jet engine.   [CO-3] [L-2]
   e) What is combustion intensity? Explain its relevance in the design of an aircraft combustion chamber.   [CO-5] [L-3]**4x5**

PART-A

Q.2   Elucidating various assumptions, formulate the mathematical expressions for momentum theory.   [CO-1] [L-2]**20**

Q.3   What is a subsonic inlet? Giving an account for its Boundary layer, analyse the phenomenon of BL separation and its effect during the aerodynamic treatment of subsonic inlet   [CO-2] [L-4] **20**

Q.4   With appropriate sketch, explain the principle of operation and working of a centrifugal compressor. How is it different from axial flow compressor in terms of functioning and use?   [CO-3] [L-1] **20**

PART-B

Q.5   What is the functional importance of Combustion Chamber in a jet engine? Giving an explained classification of the same, evaluate relative advantages and disadvantages of various types of combustion chambers in use on turbo jet engine aircraft.
                                                                  [CO-4] [L-4] **20**

Q.6   In recent years, the trend in high turbine inlet temperatures in gas turbines has required various cooling schemes. Axial-flow turbines are now designed with a high work factor to obtain lower fuel consumption and reduce the noise from the turbine. There has been great strides in cooling of turbine blades and vanes. Critically analyse the various types of cooling schemes being employed for axial flow turbines. Also explain the working of an Axial Turbine, along with its principle of operation.
                                                                  [CO-5] [L-4] **20**

Q.7   a) Explain the concepts of thrust augmentation and Thrust reversal with their requirements for aircraft operation.   [CO-6] [L-3] **10**

End Semester Examination, May 2022
B. Tech. – Fourth / Sixth Semester
PISTON ENGINE (BAE-DS-421)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory***. Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B***. Marks are indicated against each question.*

Q.1   Answer the following:
   a) Outlining the energy transfer route, briefly explain as to how does an Aircraft Petrol Engine work? Also explain as to how its working is different from a Diesel Engine?   [CO-1] [L-3]
   b) What is a forced induction system? List out any two such systems.   [CO-5] [L-2]
   c) What is a Heat engine? Differentiate between external and internal combustion engine.   [CO-2] [L-4]
   d) Explain the working of a battery ignition system.   [CO-4] [L-2]
   e) Differentiate between air and liquid cooling systems for aircraft powered with the piston engines.   [CO-6] [L-5] **4x5**

PART-A

Q.2   Describe the principle of operation of a two-stroke engine with suitable diagrams and sketches. Also explain its differences in working from a 4-stroke engine.

[CO-1] [L-3]**20**

Q.3   Following is the data obtained for a four cylinder aircraft piston engine:
   Cylinder Size: 12.5cm x 15cm
   Fly wheel speed: 1200 rpm
   Mean effective pressure: 7kg/cm^2
   Mechanical efficiency: 70%
   Clearance Volume: 150cc
   Calculate the following:
   i.)   IHP
   ii.) BHP
   iii.) Stroke bore ratio.
   iv.) Compression ratio.
   v.)   Swept volume.   [CO-2][L-4] **20**

Q.4   With appropriate diagram, explain functioning of important parts of an internal combustion engine. Evaluate the mechanical properties in respect of material of each part.   [CO-3] [L-4] **20**

PART-B

Q.5   Piston engine powered aircraft can either use a carburetor or a Fuel Injection system. Give a brief classification of various types of the modern injection systems in use with relative evaluation with a simple carburetor and also a short note of each.

[CO-4] [L-1] **20**

Q.6   Write an elaborate note on Magneto Ignition System with a diagram. Also explain its principle of operation and working.   [CO-5] [L-4] **20**

Q.7   Unless some controls are provided, the piston engine on an aircraft could overheat on

End Semester Examination, May 2022
B. Tech. – Sixth Semester
AIRCRAFT DESIGN (BAE-DS-601)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part-A** and **TWO** questions from **Part-B**. Each question carries equal marks.

Q.1 Answer the following Questions:
   a) Explain the concept of airworthiness and its application in civil and military aviation.
   [CO-1[L-2]
   b) Create a flow chart on aircraft design process. [CO-1[L-2]
   c) Differentiate limit load and ultimate load. [CO-2[L-2]
   d) Define design maneuver speed. [CO-2[L-2]
   e) What is schrenck's approximation? [CO-3[L-2]
   f) Explain the importance of Gust allievation factor. [CO-3[L-2]
   g) State law of levers. [CO-4[L-2]
   h) As a designer how do you select airfoil section for Tail design? [CO-5[L-2]
   i) Plot thrust-velocity curve for a Propeller engine and turbofan engine. [CO-6[L-2]
   j) Differentiate isotropy, orthotropy and aleotropy. [CO-4[L-2] **2x10**

PART-A

Q.2 a) Examine the various factors required to be considered to finalize the configuration of an aircraft. [CO-1] [L-3] **10**
   b) Write a short note on UAV's and their features. [CO-1] [L-3] **10**

Q.3 a) Illustrate with neat sketches the basic flight loading conditions. [CO-2] [L-3] **10**
   b) Plot V-n Diagram for Boeing 787-8 using following data.
   Gross weight = 2159.2 Kg
   Wing area = 360 m^2
   Wing aspect ratio = 10.58
   Maximum positive CL = 1.91
   Design cruise speed = 190 m/s
   Maximum positive load factor = 2.54 [CO-2] [L-4] **10**

Q.4 a) Design a Light business transport aircraft which will carry five passengers plus pilot in relative comfort in a pressurized cabin. Use the following data
   R= 6.64 *10^6 ft, C_t = 2.02 *10^{-7} s^{-1}, propeller Efficiency = 0.85, L/D$_{Max}$ = 14, empty weight fraction = 0.62
   Fuel weight fraction for take-off, climb, descent and landing are 0.97, 0.985, 1, 0.995 respectively [CO-3] [L-4] **10**
   b) Evaluate the bending moment and shear force distribution for a trapezoidal and elliptical load distribution over a wing. [CO-3] [L-5] **10**

PART-B

Q.5 a) Estimate the effects of wing loading on rate of climb, range and acceleration of an aircraft. [CO-4] [L-3] **10**
   b) Consider this Airplane.

End Semester Examination, May 2022
B. Tech. – Fourth Semester
FUEL AND LUBRICANTS (BAU-DS-401)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all;* **Q.1 is compulsory**. *Attempt any **TWO** questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:
   a) Name some hydrocarbons present in crude oil.   [CO-1] [L-1]
   b) What do you understand by cloud and pour point?   [CO-1] [L-1]
   c) Why fuel and lubricants used in automobiles should have high corrosion stability?
                                                                                                           [CO-3] [L-3]
   d) Explain the factors influencing ignition delay period.   [CO-3] [L-2]
   e) What are the important properties of an automotive fuel?   [CO-4] [L-2]
   f) Can petrol be used as a fuel in diesel engines? Discuss.   [CO-1] [L-1]
   g) What is the significance of saponification number?   [CO-3] [L-4]
   h) What are the advantages of an electric vehicles over the vehicles driven using petrol
      and diesel?   [CO-6] [L-5]
   i) Explain lubricating emulsion.   [CO-6] [L-4]
   j) Discuss hydrodynamic lubrication.   [CO-5] [L-2] **2x10**

PART-A

Q.2   With the help of neat diagram, explain the process of the petroleum refining. Further, explain the different products derived through the distillation process.   [CO-1] [L-3] **20**

Q.3   a) Discuss the following fuel properties:
         i) Precipitation number.
         ii) API gravity.   [CO-2] [L-3] **10**
      b) Explain the working of Redwood viscometer with the help of a suitable diagram and discuss the procedure to measure the viscosity of lubricant.   [CO-5] [L-3] **10**

Q.4   a) Explain the stages of combustion in S.I engines with the help of a neat sketch.
                                                                                                        [CO-3] [L-3] **10**
      b) Discuss the effect of the following engine variables on flame propagation:
         i)   Air-fuel ratio.
         ii) Compression ratio.
         iii) Engine load.
         iv) Engine speed.   [CO-3] [L-4] **2½x4**

PART-B

Q.5   a) Why solar energy operated vehicles are not a success on Indian roads? Discuss.
                                                                                                        [CO-4] [L-5] **10**
      b) Draw and explain the block diagram of hybrid electric vehicle.   [CO-4] [L-4] **10**

Q.6   a) Give detailed classification of lubricating oils. Explain their properties and various tests performed to find their actual usage.   [CO-5] [L-3] **10**
      b) Discuss the application of grease in automobiles.   [CO-5] [L-2] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
INTERNAL COMBUSTION ENGINES AND GAS TURBINE (BAU-DS-421)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer the following in briefly:
   a) What is the functional requirement of injection system?   [CO-1] [L-1]
   b) Need of pump for injection system. Justify the statement.   [CO-1] [L-1]
   c) Examine the factors which does detonation depend.   [CO-1] [L-3]
   d) How the efficiency of diesel cycle is greater than auto cycle at same compression ratio and heat rejection.   [CO-2] [L-2]
   e) State the assumption made for air standard cycles.   [CO-2] [L-2]
   f) What do you understand by the term 'Viscosity' of an oil?   [CO-1] [L-1]
   g) Overcooling is disadvantages for vehicle, justify.   [CO-2] [L-2]
   h) Write formula for Mechanical efficiency.   [CO-2] [L-2]
   i) Define 'heat balance sheet'.   [CO-3] [L-1]
   j) Inter cooling will effect the efficiency of engine. Justify.   [CO-2] [L-1]
   2x10

PART-A

Q.2   In an ideal Diesel cycle, the pressure and temperature are 1.03 bar and 27º C respectively. The maximum pressure in the cycle is 47 bar and the heat supplied during the cycle is 545 kJ/kg. Determine: i) the compression ratio ii) the temperature at the end of compression iii) the temperature at the end of constant pressure combustion and iv) the air-standard efficiency. Assume γ=1.4 and Cp = 1.004 kJ/kg K for air.
   [CO-4][L-5]**20**

Q.3   a) Explain the following terms in connection with air fuel mixture:
      a) Rich mixture.
      b) Stoichiometric mixture.   [CO-2][L-3]**10**
   b) Analyze the factors which affect the process of carburetion.   [CO-4][L-4]**10**

Q.4   a) Describe with suitable sketches the combustion phenomenon in SI engines, and explain the stages of combustion.   [CO-2][L-2]**10**
   b) Analyze the parameters which affecting the delay period.   [CO-4][L-4]**10**

PART-B

Q.5   a) Differentiate in splash and circulating pump lubrication system on the basis of working principal.   [CO-3][L-3]**10**
   b) State the advantages and disadvantages of air-cooling system.   [CO-2][L-2]**10**

Q.6   An I.C. engine uses 6 kg fuel having calorific value 44000 kJ/kg in one hour. The brake power developed is 18kW. The temperature of 11.5 kg of cooling water found to rise through 25º C per minute. The temperature of 4.2 kg of exhaust gas with specific heat 1 kJ/kg K was found to rise though 220º C. Draw heat balance sheet for the engine.

End Semester Examination, May 2022
B. Tech. – Sixth Semester
AUTOMOTIVE COMPONENT DESIGN (BAU-DS-601)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Q.1 Answer the following in briefly:
a) What are the desired properties of a good lubricant? [CO-3] [L-1]
b) What are the methods of reducing stress concentration? [CO-1] [L-1]
c) Enlist stress is induced in helical extension spring. [CO-2] [L-1]
d) Explain the functions of piston ring. [CO-5] [L-2]
e) What is meant by spring rate and spring index? [CO-2] [L-1]
f) Define 'endurance limit'. [CO-1] [L-1]
g) Enlist types of force acting on connecting rod. [CO-2] [L-1]
h) Define the function of the cylinder liner. [CO-1] [L-1]
i) Enlist various types of bearing. [CO-3] [L-1]
j) Define the module and pitch circle diameter of gears. [CO-2] [L-1]

2x10

PART-A

Q.2 a) Derive the expression for Goodman criteria for combination of stresses under reversal axial loading for ductile materials. [CO-1][L-3] **10**

b) A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m^2 and − 150 MN/m^2. Determine the value of minimum ultimate strength according to 1. Gerber relation; 2. Modified Goodman relation [CO-1][L-3] **10**

Q.3 a) A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted?. The pressure angle of the gear may be taken as 20°. [CO-3][L-3] **10**

b) A helical compression spring made of oil tempered carbon steel, is subjected to a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa, find : 1. Size of the spring wire, 2. Diameters of the spring, 3. Number of turns of the spring, and 4. Free length of the spring. The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm^2. [CO-2][L-3] **10**

Q.4 The following data is given for a hydrostatic thrust bearing:
Thrust load = 500 kN
Shaft speed = 720 rpm
Shaft diameter = 500 mm
Recess diameter = 300 mm
Film thickness = 0.15 mm

End Semester Examination, May 2022
B. Tech. – Sixth Semester
OFF ROAD VEHICLES (BAU-DS-623)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all;* **Q.1 is compulsory**. *Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Q.1   Answer in brief:
  a) What is differential lock? What purpose does it serve in tractor?   [CO-2][L-1]
  b) Define 'ROPS'.   [CO-1][L-1]
  c) Give five application of forklift.   [CO-2][L-2]
  d) Differentiate between HOE and RAKES.   [CO-3][L-3]
  e) What are hoes? For what purpose they are used.   [CO-2][L-2]
  f) What do you mean by tilt in dozers?   [CO-1][L-1]
  g) Explain three ways of classification of bulldozers.   [CO-2][L-3]
  h) Name three important parts of Bush Cutter.   [CO-1][L-2]
  i) What is a grader? For what purpose it is used.   [CO-1][L-1]
  j) Name three Indian companies manufacturing scrappers.   [CO-1][L-2] **2x10**

PART-A

Q.2   a) Differentiate between land cleaning and Earth moving machines.   [CO-3] [L-4] **10**
        b) With the help of neat sketch explain the important parts of Backhoe loader.
                                                                                    [CO-3] [L-3] **10**

Q.3   A designer has to design a forklift for a tractor assembly unit what are the different parts he will select and why? Draw a labelled lay out of his design.   [CO-3] [L-3] **20**

Q.4   a) Discuss the new developments for comfort and safety of tractor.   [CO-2] [L-2] **10**
        b) Define 'bore ratio'. How this parameter helps in engine design of tractors?
                                                                                    [CO-1] [L-1] **10**

PART-B

Q.5   A highway is to be constructed in Aravalli Hills. As a Site Engineer what are the different heavy equipment's required for completion of task? Justify the same with usage.
                                                                                    [CO-4] [L-4] **20**

Q.6   As a Site Engineer what are the different considerations you will consider for estimating minimum cost per cubic metre of output while using heavy construction machine.
                                                                                    [CO-5] [L-6] **20**

Q.7   Compare power shovel, backhoe and dragline by taking different parameters with the help of table.   [CO-6] [L-6] **20**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
AUTO REFRIGERATION AND AIR CONDITIONING (BAU-DS-641)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 3

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Spl. Instruction:
1. *Students are allowed to use **blank Psychrometric chart**.*
2. *Students are allowed to use steam tables.*

Q.1   a) Refrigerants are designated as R-11, R-134, R-729 and R-1150. Determine their chemical formula   [CO-1,2][L3]
      b) What will be the designations of following refrigerants?
         i)   Water
         ii) Carbon dioxide
         iii) Air
         iv) Ammonia
         v) SO_2 [CO-1,2][L3]
      c) Compare the performance of following aircraft refrigeration systems using DART:
         i)   Simple air refrigeration system
         ii) Boot Strap
         iii) Boot Strap Evaporative
         iv) Regenerative air cooling system
         v)   Reduced Ambient air   [CO-2] [L2]
      d) Represent the following cycles on a T-S diagram:
         i)   Reduced Ambient air type aircraft refrigeration system
         ii) Boot Strap Evaporative type aircraft refrigeration system   [CO-2][L2]
      e) A refrigerating system works on a vapor-compression cycle. How will the work output and efficiency of such a system change if its condenser pressure is decreased? Discuss the effect with the help of a p-h diagram.   [CO-3][L3]
      f) Represent the process of Cooling and Dehumidification on Psychrometric chart.
                                                                               [CO-5][L3]
      g) Define the terms: "relative humidity" and "specific humidity."   [CO-5][L1]
      h) What do you understand by the terms "Dry Bulb Temperature" and "Wet Bulb Temperature"?   [CO-4][L1]
      i) If the volume of moist air with 60% relative humidity is isothermally reduced to one-third its original volume then what will be the change in relative humidity of moist air.   [CO-3][L3]
      j) What is the function of following components in VARS?
         i) Absorber   ii) Generator   [CO-2,3] [L1]
                                                                               2x10

PART-A

Q.2   a) In a Bell Coleman refrigeration plant, air is drawn from a cold chamber at 1 bar. The temperature at the inlet to the compressor is 10 °C and air is compressed to 5 bars. It is then cooled to 25 °C in a cooler before expanding in expansion cylinder where

End Semester Examination, May 2022
OPEN ELECTIVE - COMMON FOR ALL BRANCHES
ELECTRIC MOBILITY (BAU-OE-001)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 **Fill in the blanks:**

a) Chopper is an electronics device which converts _____ voltage / power to _____voltage or power.

b) The DC converter topologies are_____, _____ and _____.

c) If three 3F capacitors are joined in series, the equivalent capacitance is _____.

d) In the case of Li ion battery _____ is similar to the size of the pool, while _____ is comparable to draining the pool as quickly as possible.

e) Material of positive and negative electrode in Lithium ion battery are _____ and _____.

f) Prius is a _____ vehicle developed by company _____.

g) The main causes of aerodynamic drag are _____ and _____.

h) Permanent magnet motors with trapezoidal air gap flux distribution are called _____.

Answer in brief:

i) A car has a weight of 9000 N. Calculate rolling resistance if constant of rolling resistance is 0.11.

j) Calculate air resistance at 30 Kmph if the air resistance at 10 kmph is W.   **2x10**

PART-A

Q.2 a) Explain the working of the four main components of an electric vehicle with their functions.   [CO-2][L-2] **15**

b) Give specification of M&M-Electric car E_2O.   [CO-2][L-2] **5**

Q.3 Sagar Mishra wants to design electric bike having gross vehicle weight of 198 kg. The other values considered for design are K_r=0.02, gradient angle = 30°, radius of wheel = 6 inches transmission gear ratio = 4. The bike achieves max speed of 40km/hr in 5 seconds. Calculate power and torque requirement of the motor for the designed bike.

[CO-6][L-6] **20**

Q.4 Write short notes on:

a) Single and Multi-motor Drives.

b) In Wheel Drives.   [CO-2][L-2] **10x2**

PART-B

Q.5 a) Compare 'microprocessor' and 'microcontroller'.   [CO-4][L-4] **10**

b) Justify the need of Chopper in electric vehicles.   [CO-5][L-5] **10**

Q.6 a) As a designer of EV you have to select a battery for a vehicle. Which battery technology you will go for and why?   [CO-6][L-6] **15**

b) Draw and explain the equivalent circuit model of a battery.   [CO-2][L-2] **5**

End Semester Examination, May 2022
B. Tech. – Second Semester
BIOLOGY FOR ENGINEERS (BBT-100)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
   a) How doorganisms respond to environmental stimuli, explain with examples?
   b) Define biodiversity and mention its types.
   c) Highlight the special features of Archaebacteria.
   d) Distinguish between in-situ and ex-situ bioremediation with examples.
   e) Which metals are found in acid mine drainage?
   f) Why is 'AB' blood group called universal acceptor?
   g) Identify the functions of epithelial tissue.
   h) What are hormones give any two examples with their functions?
   i) Distinguish between 'blood' and 'plasma'.
   j) Enumerate the major types of biological data.   [CO-1] [L-1] **2x10**

PART-A

Q.2   a) Differentiate between living things and non-living things.   [CO-2] [L-2] **10**
       b) Describe the structure of a prokaryotic cell.   [CO-2] [L-2] **10**

Q.3   a) Identify different types of microorganisms and mention their role in an ecosystem.
                                                                       [CO-2] [L-3] **10**
       b) Evaluate the applications of microbes in environmental cleaning.   [CO-2] [L-5] **10**

Q.4   a) Broadly classify carbohydrates and give examples of each class.   [CO-3] [L-4] **10**
       b) Illustrate various levels of structural organization of proteins.   [CO-3] [L-3] **10**

PART-B

Q.5   a) Categorize human tissues mentioning their salient features and functions.
                                                                       [CO-3][L-4] **10**
       b) Illustrate the path of air in respiratory system and explain the process of breathing.
                                                                       [CO-3] [L-2] **10**

Q.6   a) Demonstrate the mechanism of blood clotting in humans.   [CO-4] [L-2] **10**
       b) Analyze the role of body fluids and electrolytes in maintaining homeostasis.
                                                                       [CO-4][L-4] **10**

Q.7   a) Elaborate the process of flow of information within a biological system.
                                                                       [CO-4] [L-6] **10**
       b) Assess the importance of computational methods in biological data analysis.
                                                                       [CO-4][L-5] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
MOLECULAR BIOLOGY (BBT-DS-401)

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1　Answer in brief:

a) How linking number (Lk) of a closed-circular, double-stranded DNA molecule can be changed?　　　　　　　　　　　　　　　　　[CO-2, L3]

b) A scientist randomly mutates the DNA of a bacterium. She then sequences the bacterium's daughter cells, and finds that the daughters have many errors in their replicated DNA. The parent bacterium likely acquired a mutation in which enzyme?　　　　　　　　　　　　　[CO-3, L3]

c) How melting temperature of DNA is affected by the GC content?　　[CO-1, L3]

d) What are histones and what is their principal role in chromatin structure?
　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-1, L2]

e) The following DNA strand is used as a template for transcription:
3' CGTAAGCGGCT 5'
Write the sequence of RNA strand produced.　　　　　　　　　[CO-6, L3]

f) RNA synthesis is much more error-prone that DNA synthesis. Why is this tolerable?　　　　　　　　　　　　　　　　　　　　　[CO-2, L5]

g) Explain why the pre-mRNAs of many eukaryotic genes are much larger than expected from the known sizes of the proteins they encode.　　[CO-5, L3]

h) Most prokaryotic mRNAs have well defined 3' ends terminating in poly(A) tails of ~ 250 nucleotides. State whether the statement is true of false with proper justification.　　　　　　　　　　　　　　　　　　[CO-6, L3]

i) Differentiate between autonomous and non autonomous transposable elements.　　　　　　　　　　　　　　　　　　　　　　[CO-4, L3]

j) Lac operon is both positively and negatively regulated. Justify.　[CO-2, L3]

2x10

PART-A

Q.2　a) Label the bands with the following DNA molecules with the same length with different topology.
　　　i) Closely circular DNA with no supercoiling.
　　　ii) Supercoiled DNA.
　　　iii) Linear double-stranded DNA.
　　　iv) DNA molecule coiled around each other with some writhes.
　　　Give justification for your answer　　　　　　　　[CO-1] [L-2] **10**

b) Draw a typical eukaryotic cot curve. Explain what the different peaks depict.
　　　　　　　　　　　　　　　　　　　　　　　　[CO-1] [L-2] **10**

Q.3　a) How DNA polymerase and its associates proceed to make the copies of DNA?
　　　　　　　　　　　　　　　　　　　　　　　　[CO-2] [L-2] **10**

b) Unlike bacterial chromosomes, the chromosomes of eukaryotes are linear having ends. These ends pose a problem for DNA replication. Justify the

End Semester Examination, May 2022
B. Tech. – Fourth Semester
IMMUNOLOGY (BBT-DS-402)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1   Answer briefly:
   a) What is paratope?   [CO- 1] [L1]
   b) Explain the characteristics of innate and adaptive immune system.
                                                                        [CO- 2] [L3]
   c) Compare antigen with hapten.   [CO- 3] [L3]
   d) Draw the labeled diagram of IgM and IgA.   [CO- 2] [L2]
   e) Write a short note on 'Human Leukocyte Antigen (HLA).   [CO- 3] [L1]
   f) Why adjuvant is use in immunization? Name some adjuvants.   [CO- 4] [L4]
   g) Differentiate between polyclonal and monoclonal antibodies.   [CO- 4] [L3]
   h) What is the principle and procedure for Ouchterlony double Diffusion Assay (ODDT)?   [CO-4] [L2]
   i) Comments on the autoimmune disorder.   [CO- 5] [L1]
   j) How active immunity is different from passive immunity.   [CO- 6] [L4] **2x10**

PART-A

Q.2   a) Describe the granulated and agranulated immune cell with their detailed structure and functions.   [CO- 1] [L3] **10**
       b) What is M cell? State the role of MALT in immune response.   [CO- 2] [L1] **10**

Q.3   a) Illustrate the detailed structure of immunoglobulin light chain gene.
                                                                [CO-3] [L3] **10**
       b) What do you understand by the term MHC? Outline the structure and function of MHC I.   [CO- 3] [L-4] **10**

Q.4   Discuss the complement system. Contrast between classic and alternate complement system.   [CO- 4] [L2] **20**

PART-B

Q.5   a) Illustrate the properties of monoclonal antibodies. Explain the technology for the production of Hybridomas.   [CO- 5] [L3] **10**

       b) Evaluate how the immune system works against bacterial infections?
                                                                [CO- 5] [L5] **10**

Q.6   a) Explain the principle and procedure for radial immune assay.   [CO- 6] [L2] **10**
       b) Compare Direct ELISA and Sandwich ELISA Techniques.   [CO- 6] [L5] **10**

Q.7   What are Vaccines? Describe different types of vaccines and procedure for their production.   [CO- 6] [L3] **20**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
FERMENTATION TECHNOLOGY (BBT-DS-403)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer briefly:
   a) Differentiate between upstream and downstream process.   [CO-1] [L-1]
   b) Describe the macro and micro nutritional requirement for the microorganism.
                                                                                                       [CO-2] [L-2]
   c) Illustrate the need for the preservation of microbial strain. State name of two preservation method.   [CO-1] [L-3]
   d) Determine a molecular method for the improvement of industrially important microbial strain.   [CO-3] [L-3]
   e) How batch culture is different from continuous culture?   [CO-4] [L-4]
   f) Evaluate the advantages and disadvantages associated with the immobilization of cells and enzymes.   [CO-5] [L-5]
   g) Discuss the different methods for the sterilization of media.   [CO-6] [L-3]
   h) Illustrate the principle of affinity chromatography.   [CO-3] [L-4]
   i) Summarize the various chromatographic techniques in downstream processing.   [CO-6] [L-1]
   j) Compare primary metabolites is from secondary metabolites.
                                                                                      [CO-5][L-5] **2x10**

PART-A

Q.2   a) Explain the concept of downstream processing. Discuss the steps of downstream processing of a precious biochemical product.   [CO-1][L-2] **10**
   b) Describe the methods for media optimization and media formulation for industrial fermentations.   [CO- 1] [L1] **10**

Q.3   a) Explain different methods for the screening of industrially important microorganisms.   [CO- 2] [L2] **10**
   b) Determine recombinant DNA approach for   the strain improvement of industrial microorganisms.   [CO- 3] [L3] **10**

Q.4   Examine the cell growth kinetics and product kinetics in batch culture Contrast continuous and Fed batch culture.   [CO-3] [L4] **20**

PART-B

Q.5   a) Discuss different methods for the immobilization of enzymes and cells.
                                                                                            [CO- 4] [L4] **10**

   b) Explain the working and application of stirred tank reactor with the help of a diagram.   [CO- 4] [L6] **10**

Q.6   a) Define 'sterilization'. Evaluate different methods of sterilization.
                                                                                            [CO- 5] [L5] **10**
   b) State the principle and working of autoclave with suitable diagram.
                                                                                            [CO- 5] [L3] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
BIOSTATISTICS (BBT-DS-404)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 3

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Q.1 a) What is the relation between of variance of sampling distribution of sample means and variance for a normally distributed population which was sampled?   [CO3] [L2]

b) What is the central limit theorem?   [CO1] [L2]

c) For a certain population we define the following events with respect to plasma lipoprotein levels (mg/dl):

$$A = (10-15); \ B = (\geq 30); \ C = (\leq 20)$$

Evaluate:

i) $A \cup B$ ii) $A \cap B$ iii) $A \cap C$ iv) $A \cup C$ [CO2] [L4]

d) Can mean be affected by mode? How?   [CO3] [L1]

e) Explain why each of the following measurements is or is not the result of a Bernoulli trial:(i) The number of surgical procedures performed in a hospital in a week, (ii) A hospital patient's temperature in degrees Celsius (iii) A hospital patient's vital signs recorded as normal or not normal.   [CO3] [L5]

f) Represent the following probability in the form of Venn diagram: [CO2] [L3]

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

g) Differentiate between categorical and ordinal variables.   [CO3] [L1]

h) Why is sampling important for a large population?   [CO4] [L2]

i) When exactly the mean of sampling distribution of sample means equals population mean?   [CO4] [L2]

j) What do you mean by degrees of freedom?   [CO5] [L2] **2x10**

PART-A

Q.2 a) A study reported an estimated mean serum cholesterol level of 183 for women aged 20–29 years. The estimated standard deviation was approximately 37. Use these estimates as the mean and standard deviation for the U.S. population. If a simple random sample of size 60 is drawn from this population, find the probability that the sample mean serum cholesterol level will be:

i)   Between 169 and 190

ii) Below 178

iii) Greater than 170

iv) Less than 150   [CO4] [L5] **10**

b) If the uric acid values in normal adult males are approximately normally distributed with a mean and standard deviation of 5.7 and 1 mg percent, respectively, find the probability that a sample of size 9 will yield a mean:

i)   Greater than 5

ii) Between 5 and 7

iii) Less than 5.7

iv) Less than 5   [CO6] [L5] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
BIOSAFETY AND BIOETHICS AND IPR (BBT-DS-405)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1   Answer in brief:
   a) What are containment facilities under the biosafety setup of a biotechnology Lab?
   b) What do you understand by –"protection of industrial designs"?
   c) Enumerate cartagena protocol.
   d) Enlist the main themes for issues related to biotechnological advancements.
   e) What are genetically modified organisms?
   f) Enlist the main themes for issues related to biotechnological advancements.
   g) Describe GMO regulation.
   h) State GMO controversies.
   i) Elaborate IPR issues in Indian context.
   j) Define the terms: 'biosafety and biosecurity'.   **2x10**

PART-A

Q.2   State your opinions on the controversial issues associated with the Golden rice project.   [CO-1] [L-1] **20**

Q.3   Why is risk assessment important for achieving biosafety?   [CO-2] [L-2] **20**

Q.4   Would you recommend the use of sterilization methods to process the waste generated while working with Hepatitis C Virus in a laboratory? Give a reason.
                                                           [CO-3] [L-4] **20**

PART-B

Q.5   Describe the world's largest bioethics program. State biosafety regulatory framework in India.   [CO-4] [L-3] **20**

Q.6   Explain different forms of IPR. Evaluate collaborative research and competitive research using suitable example.   [CO-5] [L-5] **20**

Q.7   Formulate recent developments in patent system. How plant breeder's rights helps in designing new system?   [CO-6] [L-6] **20**

End Semester Examination, May 2022

B. Tech. – Sixth Semester
PLANT BIOTECHNOLOGY (BBT-DS-601)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **Part-A** *and* **TWO** *questions from* **Part-B**. *Each question carries equal marks.*

Q.1   a) How does totipotency contribute to plant tissue culture?
        b) Why is 2, 4-D known as a callusing hormone?
        c) Differentiate between 'hybrids' and 'cybrids'.
        d) Define differentiation and de-differentiation.
        e) Enumerate the importance of haploids in crop plants.
        f) Mention the advantages of Somaclonal variations.
        g) Identify the functions of Plant growth promoting bacteria.
        h) Highlight two examples of marker assisted selection in plants.
        i) Distinguish between transient and stable gene expression.
        j) What are the advantages and disadvantages of Bt Cotton?   [CO-1] [L-1] **2x10**

PART-A

Q.2   a) Describe various sterilization techniques used in plant tissue culture. [CO-1] [L-2] **10**
        b) Give an outline of the general process of callus culture.   [CO-1] [L-2] **10**

Q.3   a) Evaluate the efficiency of different methods of protoplast isolation.   [CO-2] [L-5] **10**
        b) Organize the sequence of events in somatic hybridization.   [CO-2] [L-3] **10**

Q.4   a) Demonstrate the process of symbiotic nitrogen fixation in legumes. [CO-3] [L-2] **10**
        b) Discuss the genetic regulation of nitrogen fixation.   [CO-3] [L-6] **10**

PART-B

Q.5   a) Illustrate any one method of genome mapping.   [CO-5] [L-2] **10**
        b) Elaborate the method of Sanger sequencing.   [CO-5] [L-2] **10**

Q.6   a) Identify the mechanism of Agrobacterium mediated gene transfer in plants.
                                                                                      [CO-4] [L-3] **10**
        b) Analyze the role of virulence genes in transformation.   [CO-4] [L-4] **10**

Q.7   a) Discuss the contribution of transgenic technology in crop plant improvement.
                                                                                      [CO-6] [L-6] **10**
        b) Assess the risks associated with transgenic plants.   [CO-6] [L-5] **10**

End Semester Examination, May 2022

B. Tech. – Sixth Semester

ENVIRONMENT BIOTECHNOLOGY (BBT-DS-602)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:
   a) Pollution is also affected by seasonal variations. Justify.
   b) Define 'Eutrophication'.
   c) Are humans the major cause of acid rain?
   d) Define 'biomedical waste'.
   e) How waste water can be collected from the sources?
   f) What do you mean by sanitary landfill?
   g) Differentiate between point and non-point sources of water pollution.
   h) How is conditioning of sludge undertaken?
   i) Mention the benefits of rain water harvesting.
   j) Analyze vermin-composting as an eco-friendly technology.   **2x10**

PART-A

Q.2   a) What is Greenhouse effect? Enumerate the various consequences of increase of greenhouse gases in the atmosphere.   [CO-1] [L-1] **10**
   b) Differentiate between Ozone as a destroyer and a protector.   [CO-1] [L-2] **10**

Q.3   a) Identify what new ways and eco-friendly technologies can be adopted for waste water treatment.   [CO- 2,3,6] [L-3] **10**
   b) What do you understand by secondary waste water treatment? Describe in detail the process of Trickling filters for waste water treatment.   [CO-2] [L-1] **10**

Q.4   a) Classify the different types of hazardous wastes.   [CO-3] [L-2] **5**
   b) Composting is a sustainable waste management technique for hazardous waste. Comment and analyze the statement.   [CO-3] [L-4] **15**

PART-B

Q.5   a) What are xenobiotics? Give some typical features of recalcitrant organic compounds.
                    [CO-4] [L-1] **10**
   b) How microbes can be utilized in biodegradation and biotransformation?
                    [CO-4] [L-1] **10**

Q.6   a) Describe the concepts and principles of bioremediation using microbes. Discuss its constraints.   [CO-5] [L-2] **10**
   b) How is remediation of pollutants brought about by using plants? Give an account of various mechanisms involved in phytoremediation with their significance.
                    [CO-5] [L-1] **10**

Q.7   a) Justify the importance of Bioplastics as an ecofriendly technology.
                    [CO-1,6] [L-5] **10**
   b) Critically evaluate the role of biofuels for environment conservation in India.

End Semester Examination, May 2022
B. Tech. – Sixth Semester
DNA MICROARRARY TECHNOLOGY (BBT-DS-621)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:
   a) What are the approaches used for rapid and detail analysis of thousands of transcript?
   b) Elaborate hypothesis driven experiment.
   c) Interpret applications of dye in microarray experiment.
   d) How distance measure between two genes is done in cluster analysis?
   e) Recall application of DNA microarray experiment.
   f) What do you mean by molecular classifier?
   g) Interpret the principle behind hybridization.
   h) Describe systems biology using suitable example.
   i) State feature selection in microarray experiment.
   j) Compare time series approach with steady state approach.   **2x10**

PART-A

Q.2   a) How image analysis of microarray experiment is performed?   **10**
      b) Explain in detail the technologies used to design microarray experiment.
                                                                [CO-1] [L-2] **10**

Q.3   a) What is SAGE?   **10**
      b) Discuss the different steps followed in SAGE analysis.   [CO-2] [L-2] **10**

Q.4   Identify suitable clustering technique and state application of promoter analysis.
                                                                [CO-3] [L-3] **20**

PART-B

Q.5   The reverse engineering approach requires large data sets and extensive computational resources. Justify your answer.   [CO-4] [L-4] **20**

Q.6   a) You extracted the following mRNA sequence (among thousands of other mRNAs) from high MFC tissue:
         5'' C C U A U U G G A A U C G G A AAAAAA 3''
      b) What is the cDNA sequence that would be synthesized from this mRNA?
      c) Transcrptome profiling helps in decoding various diseases. Evaluate by taking any case study.   [CO-5] [L-5] **20**

Q.7   There are four factors (control, randomization, replication and balancer) to consider when constructing DNA microarray experiment. Design two channel arrays taking biological sample and interpret the result.   [CO-6] [L-6] **20**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
MOLECULAR DIAGNOSTICS (BBT-DS-622)

Time: 3 hrs.   Max Marks: **100**
No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Q.1 Answer in brief:
  a) Mutation is an evil agree or disagree. State reasons.   [CO.3] [L-2]
  b) Differentiate between 'prognostics' and 'diagnostics'.   [CO.1] [L-2]
  c) SSCP refers to _____.   [CO.2] [L-2]
  d) Differentiate between 'heteroduplex' and 'homoduplex'.   [CO.4] [L-2]
  e) Name two markers used in triple screen.   [CO.6] [L-2]
  f) Differentiate between 'agglutination' and 'precipitation'.   [CO.3] [L-2]
  g) Expand AFP and HCG.   [CO.2] [L-2]
  h) RIA and FIA refer to _____.   [CO.4] [L-2]
  i) Differentiate between 'prenatal' and 'postnatal'.   [CO.1] [L-2]
  j) What is genotyping?   [CO.5] [L-2] **2x10**

PART-A

Q.2 a) Explain the result analysis of DNA Sequencing. How do we interpret and trouble shoot sequencing results?   [CO.1] [L-2] **10**
  b) Molecular diagnostics utilizes principles of molecular biology tools. Justify with example.   [CO.1, CO.2)] [L-3] **10**

Q.3 a) Explain the principle and procedure for polymerase chain reaction.   [CO.2] [L-3] **10**
  b) How genotyping qualifies to be a tool for molecular diagnostics?

[CO.3, CO.4] [L-3] **10**

Q.4 Elaborate on the principle and applications of nucleic acid hybridization. Explain the types and methods for probe preparation.   [CO.2, CO.4] [L-2] **20**

PART-B

Q.5 a) How electrophoretic mobility shifts have proven to be important tools for disease diagnosis   [CO.5] [L-2] **10**
  b) What are the main considerations and hurdles one has to deliberate before prenatal diagnosis?   [CO.6] [L-2] **10**

Q.6 a) Discuss in detail the principles of various virological tests available to diagnose infections.   [CO.6] [L-2] **10**
  b) Describe two major immunoassays and their applications.   [CO.5] [L-2] **10**

Q.7 Explain in detail the background and advancements of genetic testing. Give an example to illustrate its utility in present times of diagnosis.   [CO.5, CO.4] [L-3] **20**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
CLINICAL MICROBIOLOGY (BBT-DS-623)

Time: 3 hrs. Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1
a) Contrast between toxin and toxoids. [CO-1] [L-3]
b) Explain the characteristics of gram negative cell wall. [CO-2] [L-3]
c) Evaluate the properties of heliminths. [CO-3] [L-5]
d) Name any two intestinal protozoal infection causative organisms. [CO-2] [L-1]
e) Analyze the symptoms and causative organism of amoebic dysentery. [CO-4] [L-4]
f) Name any two infections caused by aerobic bacteria. [CO-5] [L-1]
g) Mention the symptoms and name of the causative organism for Rabies. [CO-5] [L-3]
h) Discuss about Prions. [CO-4] [L-2]
i) Determine the principle and procedure of staining techniques use for the identification of Fungi. [CO-4] [L-2]
j) How will the diagnosis of viral infection in lab done? [CO-6] [L-6] **2x10**

PART-A

Q.2
a) Mention the names of small intestinal microbiota and the importance of normal bacterial and fungal microbiota to host. [CO-1] [L-1] **10**
b) What are virulence factors? Discuss various types of virulence factors in detail. [CO-2] [L-2] **10**

Q.3
a) Enlist the disease caused by Plasmodium. Explain the life cycle of Malaria Parasite. [CO-4] [L-3] **10**
b) Compare between nematodes and trematodes. Explain the life cycle of any nematode. [CO-3] [L-5] **10**

Q.4
a) Evaluate the characteristics and disease caused by gram enteric rods. [CO-4] [L-5] **10**
b) Name two-gram positive spore forming bacteria. Analyze the Bacillus anthraces infection and lab diagnosis. [CO-3] [L-4] **10**

PART-B

Q.5
a) How Viruses are classified on the basis of nucleic acid type, explain with example? [CO-4] [L-4] **10**
b) Describe the types and the life cycle of Hepatitis virus. [CO-4] [L-3] **10**

Q.6 State the general characteristics of Fungi. Contrast between cutaneous mycosis and superficial mycosis with example. [CO-5] [L-3] **20**

Q.7 Discuss the strategy for laboratory diagnosis for viral infection. How you will design an test for the molecular diagnostic procedure for the identification of pathogen. [CO-6] [L-6] **20**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
INTRODUCTION TO FLUID MECHANICS (BCE-DS-401)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.

Q.1   Define the following:
   a) Dynamic Viscosity.
   b) Laminar Flow and Turbulent Flow.
   c) Compressibility.
   d) Cavitation.
   e) Stream potential function.
   f) Reynold Number.
   g) Dimensions of specific weight.
   h) Forced Vortex Flow.
   i) M.K.S. units of Viscosity.
   j) Buoyancy.   **2x10**

PART-A

Q.2   a) State Newton's Law of viscosity   [CO-1] [L-1] **5**
   b) Calculate the capillary rise in a glass tube of 2.5mm diameter when immersed vertically in water and mercury. Take specific tension 0.0725N/m for water and 0.52N/m for mercury in contact with air. The specific gravity of mercury is 13.6 and angle of contact is 130°   [CO-2] [L-4] **15**

Q.3   a) Elucidate the term manometers and its types.   [CO-2] [L-1] **5**
   b) The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp. Gravity 0.9 is flowing. The center of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20cm.   [CO-2] [L-5] **15**

Q.4   Derive Continuity Equation in 3 dimension Cartesian Coordinates   [CO-3] [L-6] **20**

PART-B

Q.5   a) Derive Euler's equation of motion   [CO-2] [L-4] **10**
   b) A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200mmat position A to 500mm at position B which is 4m at a higher level. If the pressures at A and B are 9.81N/cm^2 and 5.886N/cm^2 respectively and discharge is 200litres/second, determine the loss of head.   [CO-4] [L-6] **10**

Q.6   An orificemeter with orifice dia 10cm is inserted in a pipe of 20cm dia. The pressure gauges fitted upstream and downstream of the orifice meter gives the readings of 19.62N/cm^2 and 9.81N/cm^2 respectively. Co-efficient of discharge for the meter is 0.6. Find the discharge of water through pipe.   [CO-5] [L-5] **20**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
INTRODUCTION TO SOLID MECHANICS (BCE-DS-402)

Time: 3 hrs

Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1.   Answer the following in briefly:
  a) Define the terms "*Stress*" and "*Strain*".   [CO-1] [L-2]
  b) Differentiate between "*lateral and longitudinal strain*".   [CO-1] [L-2]
  c) What do you understand by "*Point of Contraflexure*"?   [CO-2] [L-2]
  d) Determine the section modulus of a perfectly rectangular section of width "b" and depth "d".   [CO-2] [L-2]
  e) State the assumptions for the Theory of Simple Bending.   [CO-3] [L-2]
  f) Illustrate the importance of *Shear stresses* in bending of a beam.   [CO-4] [L-2]
  g) What do you understand by "*Superposition Principle*"?   [CO-4] [L-2]
  h) A rectangular beam 100mm wide and 250mm deep is subjected to a maximum shear force of 50 kN. Evaluate average shear stress and maximum shear stress of the section.   [CO-5] [L-4]
  i) State the assumptions made in the theory of circular shafts subjected to torsion.
                                                                                      [CO-5] [L-2]
  j) Differentiate between thin cylinders and thick cylinders on the basis of stress distribution.   [CO-6] [L-2] **2x10**

PART-A

Q.2   a) Explain in details the different types of stress. Derive a relation between three elastic constants of elasticity.   [CO-1] [L-3] **8**
  b) A tensile test is conducted on a mild steel bar of diameter 3cm. Gauge length of the bar is 20 cm and the load at elastic limit is 250 kN. Extension at a load of 150 kN is 0.21mm. Maximum load and total extension are 380mm and 60mm respectively. Diameter if the rod at the failure is 2.25cm. Evaluate:
  i) Young's Modulus
  ii) the stress at elastic limit
  iii) the percentage elongation
  iv) the percentage decrease in area.   [CO-1] [L-4] **12**

Q.3   a) Derive an expression for determining shear force and bending moment of a simply supported beam subjected to UDL throughout its span.   [CO-3] [L-5] **5**
  b) Draw Shear force and Bending moment of the figure given below: [CO-3] [L-4] **15**
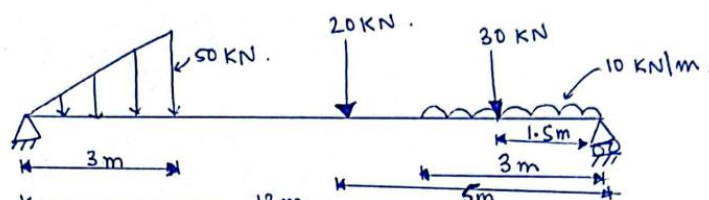
End Semester Examination, May 2022
B. Tech. – Fourth Semester
SURVEYING AND GEOMATICS (BCE-DS-403)

Time: 3 hrs.   Max Marks: **100**

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
a) Distinguish between "Chain Surveying" and "Compass Surveying".   [CO-1] [L-2]
b) Define "Scale" in context with surveying.   [CO-1] [L-1]
c) Convert 38^{hrs} 47^{min} 55^{sec} into angles.   [CO-2] [L-2]
d) With the help of a neat sketch, compare "Latitude" and "Departure" in Traverse Surveying.   [CO-2] [L-2]
e) State the rules followed for writing the data in a Levelling Book. [CO-3] [L-2]
f) What do you understand by the term "Contours"?   [CO-3] [L-2]
g) Compare "Precision" and "Accuracy".   [CO-4] [L-2]
h) Distinguish between "Terrestrial Photogrammetry" and "Aerial Photogrammetry".
                                                                       [CO-5] [L-2]
i) If the average elevation of the terrain is 1500 m from MSL, calculate the flight height of the aircraft at the time of exposure if the focal length of the camera is 20 cm; and the vertical photograph showing a flat terrain has a line of 4.50 cm long to a corresponding line XY of length 450 m on the ground.   [CO-5] [L-3]
j) Explain "Remote Sensing" as a part of Aerial Photogrammetry.   [CO-6] [L-1] **2x10**

PART-A

Q.2   a) In surveying of a land, chaining was done using a chain of 30 m found correct to 30 m before the start of the chaining work. After the measurement of length of line 4360 m, the length of the chain was checked and found to be 30.30 m. After sometime, the measurement of another length of 6450 m, the length of the chain was checked and found to be 30.50m. Determine the true length of the measurement of lines.   [CO-1] [L-3] **10**
b) Illustrate the "Systems of Bearing" with the help of a neat sketch. [CO-1] [L-3] **10**

Q.3   Determine the RL of different points by "Height of Instrument Method" and "Rise and Fall Method" and show Arithmetic Check for the following staff Readings taken from an Auto Level with a BM of 250 m:3.10 m, 3.00 m, 1.60 m, 2.40 m, 1.40 m, 2.50 m, 3.90m, 1.20 m, 2.80 m, 1.65 m, 1.85 m. The instrument was shifted after 3rd, 7th and 9th reading.   [CO-2] [L-3] **20**

Q.4   a) What do you understand by "Contour Interval"? State the various properties of "Contours" with the help of neat sketches.   [CO-3] [L-2] **10**
b) Define: Simple Curve, Compound Curve and Reverse Curve with the help of neat sketches. Also,explain the various components of a Simple Curve diagrammatically.
                                                                       [CO-3] [L-2] **10**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
MATERIALS, TESTING AND EVALUATION (BCE-DS-404A)

Time: 3 hrs.   Max Marks: **100**
                                                                 No. of pages: 1

Note: *Attempt **FIVE** questions in all;* **Q.1 is compulsory***. Attempt any **TWO** questions from* **PART-A** *and* **TWO** *questions from* **PART-B***. Marks are indicated against each question.*

Q.1   Answer in brief:
    a) Explain normal consistency.   [CO-1] [L-2]
    b) Discuss the precautions to be taken while storing cement.   [CO-1] [L-2]
    c) Briefly describe the properties of adhesives.   [CO-6] [L-2]
    d) Explain the characteristics of good oil paints.   [CO-5] [L-2]
    e) Define the physical properties of building materials.   [CO-4] [L-1]
    f) Differentiate between impact strength and toughness.   [CO-1] [L-2]
    g) Describe the mode of failure (brittle or ductile).   [CO-1] [L-1]
    h) Differentiate between setting and hardening of cement.   [CO-6] [L-2]
    i) Choose the condition where do you use cement mortar.   [CO-5] [L-2]
    j) Explain the techniques of measuring pulse velocity through concrete.
                                                                 [CO-4] [L-2] **2x10**

PART-A

Q.2   Illustrate with flow diagrams the dry and wet process of manufacture of cement in details also discuss its components.   [CO-1][L-3] **20**

Q.3   Describe the use of(a) Heat insulating materials.(b) Sound insulating materials(c) Damp proofing materials.   [CO-3][L-4] **20**

Q.4   Explain various physical properties of building materials.   [CO-6][L-2] **20**

PART-B

Q.5   a) Explain compressive stress and shear stress.   [CO-1] [L-2] **5**
    b) A specimen of steel 20 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.25 mm under a load of 80 kN and the load at elastic limit is 102 kN. The maximum load is 130 kN. The total extension at fracture is 56 mm and diameter at neck is 15 mm. Evaluate
      i)   The stress at elastic limit.
      ii) Young's modulus.
      iii) Percentage elongation.
      iv) Percentage reduction in area.
      v)   Ultimate tensile stress   [CO-1] [L-4] **15**

Q.6   a) Explain the rate of hydration and mechanism of hydration in cement with proper chemical equations involved in it.   [CO-3] [L-2] **10**
    b) Describe the procedure for conducting following tests on cement:
      i)   Soundness test.

End Semester Examination, May 2022
B. Tech. – Fourth Semester
IT DATA SECURITY (CS-423)

Time: 3 hrs. Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all;**Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Each question carries equal marks.*

Q.1 Answer in brief:
   a) Define data security with its importance.
   b) What is companion virus?
   c) What is a Botnet?
   d) How is spear phishing different from clone phishing?
   e) Define 'pharming'.
   f) Differentiate between 'bluejacking' and 'bluesnarfing'.
   g) What are the parts of a cryptosystem?
   h) Define data masking process and why it is done?
   i) Give counter measures for fire suppression.
   j) Explain "Spoofing". **2x10**

PART-A

Q.2 a) Explain how data security is beneficial for maintaining privacy of data. What are the elements to consider for a better security mechanism? **10**
   b) What is banking fraud? Explain banking fraud threats in detail. **10**

Q.3 a) What is query format for Sql injection? Give suitable example. **5**
   b) What do you understand by privilege elevation? **5**
   c) Name different types of malwares. Explain any two malware in detail. **10**

Q.4 Explain the following terms:
   a) Bot Net threat.
   b) Trojan horses.
   c) Passive capturing threat.
   d) Blue jacking. **5×4**

PART-B

Q.5 a) Explain data encryption process in detail with its benefits. **5**
   b) Describe in detail the following:
      i) Honeypots.
      ii) IPS.
      iii) DMZ. **5x3**

Q.6 a) What are physical security counter measures? **10**
   b) What is function of connection control? **5**
   c) What IPS does? Also give need of protocol validation. **5**

Q.7 Discuss in detail any database activity monitoring tool used in data security. **20**

End Semester Examination, May 2022
COMMON FOR ALL COURSES — Fourth Semester
BUSINESS PROCESSES (CS-610)

Time: 2 hrs.   Max Marks: **50**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **PART-A is compulsory.** *Attempt any* **FOUR** *questions from* **PART-B.** *Marks are indicated against each question.*

PART-A

Q.1 a) List at least Three Cross Industry or Industry applications of SAP.
b) What does "R" 4 "3" symbolizes in R/3 system?
c) List few components of SAP Net weaver.
d) List all the information mentioned on 'status bar of a SAP system'.
e) What is meant by Master Data? Give an example.
f) How can a billing document be created in SAP system?
g) What is meant by Product Lifecycle Management?
h) List benefits drawn from effective procurement.
i) What is the significance of Business Intelligence Tool?
j) What is the primary source for management accounting?   **1×10**

PART-B

Q.2   What is SAP ERP system? Discuss SAP's business suite product and its various applications in detail.   [CO-2][L-2] **10**

Q.3   List and describe the various forms of help options available in SAP system.
[CO-2] [L-1] **10**

Q.4   Explain how SAP ERP support the key processes in production cycle of logistics.
[CO-2] [L-2] **10**

Q.5   Explain in detail the tasks associated with a procurement cycle in SAP.
[CO-2] [L- 2] **10**

Q.6   What is General Ledger Accounting in SAP Financials? Explain with the help of diagram, various tasks in Financial Accounting in SAP.   [CO-2] [L-2] **10**

Q.7   Differentiate between OLTP and OLAP environment. Also, describes the advantages of SAP net weaver system in detail.   [CO-2] [L- 2] **10**

End Semester Examination, May 2022

B. Tech. – Seventh / Eighth Semester

IT BUSINESS CONTINUITY AND DISASTER RECOVERY PLANNING
(CS-704)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
   a) Discuss the different Phases of disaster.
   b) Define BC/DR Team.
   c) Discuss the need of Event logs.
   d) Discuss the Risk Assessment.
   e) List the best course of action to take during a medical emergency.
   f) Discuss the key elements of business continuity.
   g) Discuss the Project Close out.
   h) Discuss the Disaster Recovery.
   i) Describe the Business Impact Analysis.
   j) Classify the different techniques to identify Earthquake Risk Assessment.   **2x10**

PART-A

Q.2   a) Explain the different Backup Techniques.   **10**
      b) Discuss the disaster in IT industry. What are the different types of disaster?   **10**

Q.3   a) Explain the 'incremental differential backup'.   **10**
      b) Describe project and also discuss the elements of project success.   **10**

Q.4   a) Describe RTO and RPO in detail.   **10**
      b) Discuss the threat and vulnerability assessment methodology.   **10**

PART-B

Q.5   a) Discuss the phases of business continuity and disaster recovery.   **10**
      b) Explain the role of communication plans.   **10**

Q.6   a) Explain the 'Testing the BC/DR Plan'.   **10**
      b) Discuss the 'performing IT systems' and 'security Audits'.   **10**

Q.7   a) Discuss the activity of plan maintenance.   **10**
      b) Explain the different activities involved in BCM and DRP.   **10**

End Semester Examination, May 2022
B. Tech. – Eighth Semester
MACHINE LEARNING TECHNIQUES (CS-808)

Time: 3 hrs. Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all;* **Q.1 is compulsory**. *Attempt any **TWO** questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer the following questions:
  a) Mention any two techniques under Supervised Learning.   [CO1][L1]
  b) Describe the advantage of normalizing/standardizing the values.   [CO1][L1]
  c) Discuss the concept of Backpropagation.   [CO3][L3]
  d) Differentiate between Generative and Discriminative models.   [CO5][L4]
  e) Mention the fundamental behind Inductive Learning.   [CO5][L6]
  f) Compare and Contrast between ICA and PCA techniques.   [CO3][L4]
  g) Define 'Q learning'.   [CO5][L1]
  h) Illustrate any two applications of deep learning in the real world.   [CO6][L3]
  i) Outline Bellman equation and their use in Reinforcement learning.   [CO5][L4]
  j) Define 'unsupervised learning' with suitable examples.   [CO3][L1]

  2x10

PART-A

Q.2 a) Define the terms: Mean, Standard Deviation, Variance and Co-variance by giving suitable examples.   [CO2] [L1] **10**
  b) Explain Gaussian distribution. Draw appropriate diagram for the same.

  [CO1] [L2] **10**

Q.3 a) Discuss the advantages of Feature selection. What are support vectors in SVM?

  [CO3] [L2] **10**
  b) List the reasons of Ensemble methods having edge over Classical Machine Learning methods. Describe the concept of Bagging.   [CO4][L4] **10**

Q.4 a) Explain K means clustering algorithm with an example.   [CO3] [L3] **10**
  b) Compare between PCA with ICA. Elaborate the steps followed in ICA. [CO1] [L4] **10**

PART-B

Q.5 a) Elaborate Policy and value functions and their use in Reinforcement learning.

  [CO4] [L3] **10**
  b) Explain Bellman equation. Outline the role of Markov Decision Process in reinforcement Learning.   [CO5] [L2] **10**

Q.6 a) Draw structure of Feed forward ANN. Discuss hyperparameter tuning in ANN.

  [CO4] [L6] **10**
  b) Discuss back propagation algorithm and its use in a multi-layer perceptron.

  [CO5] [L2] **10**

Q.7 a) Explain the working principle of Semi supervised learning techniques. How graph

End Semester Examination, May 2022

B. Tech. – Eighth Semester

NATURAL LANGUAGE PROCESSING (CS-824)

Time: 3 hrs. Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 a) Briefly explain the tutoring authoring system.
  b) Define 'Parsing'. Explain the top-down and bottom-up approach with the help of an example.
  c) Describe the logic and inference pragmatics in the Natural Language Processing.
  d) Differentiate between the 'Natural Language Processing' and 'Natural Language understanding'.
  e) Give four examples of machine translation using a common language. **4x5**

PART-A

Q.2 a) Explain the components of Natural Language Processing in detail. **10**
  b) Differentiate between syntactic and semantic interpretation with the help of example. **10**

Q.3 a) How the ambiguity of a grammar is resolved. Prove that the grammar G with given production is ambiguous.
      S→a | aAb | abSb
      A → aAAb | bS **10**
  b) Explain in detail the Chomsky hierarchy of grammar. **10**

Q.4 a) Differentiate between 'ATN' and 'RTN' with the help of example. **10**
  b) How the technique of computation linguistic is applied. Elaborate with the help of example. **10**

PART-B

Q.5 a) Create the semantic network for the following "John saw Bob talk to Alice yesterday. Alice met Susan twice. Susan knows that Bob likes Fred." **10**
  b) How the graph models are optimized and also explain the evaluation technique for optimization. **10**

Q.6 a) Explain in detail the issues and challenges faced in machine translation approaches. **10**
  b) Differentiate between the 'rule based' and 'semantic based' machine translation along with their applications. **10**

Q.7 a) How the apple iphone siri work using Natural Language Processing. **10**
  b) Create a man-machine interface for showing the application of NLP in intelligent work processor. **10**

End Semester Examination, May 2022
B. Sc. (Data Science) – Sixth Semester
BIG DATA TECHNOLOGIES (DS-602)

Time: 3 hrs.

Max Marks: **75**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all.* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1
a) Define Big Data and mention its types with examples.
b) Differentiate between structured, semi-structured and unstructured data.
c) What are the main components of a Hadoop application?
d) What is the best hardware configuration to run Hadoop and what is commodity hardware?
e) What are the different ways of executing Pig script?
f) What is a bag in Pig Latin?
g) List the diagnostic operators in Pig.
h) What are the data types of Pig Latin?
i) Mention the use of Hive in Hadoop eco-system.
j) What is Meta store in Hive? **1.5x10**

PART-A

Q.2
a) Draw the Hadoop ecosystem. What happens to a Name Node that has no data? Whenever a client submits a hadoop job, who receives it? [CO1] [L1,L2] **8**
b) What is a replication factor? Explain what happens if during the PUT operation, HDFS block is assigned a replication factor 1 instead of the default value 3.
[CO1] [L1,L2] **7**

Q.3
a) Explain the steps involved in deploying a big data solution. [CO2] [L2,L3] **7**
b) Differentiate between CSV Files, JSON Files, Avro FIiles and Parquet Files.
[CO2] [L2,L3] **8**

Q.4
a) What is a Job Tracker? Explain job scheduling through Job Tracker. [CO2] [L1] **8**
b) Explain about the partitioning, shuffle and sort phase in Map reduce with an Example. [CO2] [L2] **7**

PART-B

Q.5
a) When the Map reduce framework was not there, How parallel and distributed processing used to happen in a traditional way? [CO3] [L4] **8**
b) Show the complete workflow of MR for the following example:
Ex: "Hello Class Welcome to Big Data Technology! This will provide insight into Big Data Hype, its technologies and applications" [CO3] [L4] **7**

Q.6
a) Draw the Pig Architecture and elaborate on the components of Pig Execution Environment. [CO4] [L3] **7**

End Semester Examination, May 2022
B. Sc. (Data Science) – Sixth Semester
PREDICTIVE ANALYTICS (DS-612)

Time: 3 hrs.   Max Marks: **75**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **taking at least ONE question** *from each* **UNIT.** **Q.1 is compulsory**. *Marks are indicated against each question.*

Q.1   a) Demographic predictive questions parameters.   CO (1,2) (L-1) **2**

b) Connect the Multivariate analysis for prediction.   CO (1,2) (L-1) **3**

c) How has the covid-19 affected prices of agricultural produce in your locality?

CO (1) (L-2) **2**

d) Define Promotional activities.   CO (3,4) (L-2) **2**

e) Give the example on Linear Regression for prediction.   CO (1,4) L-2 **3**

f) Difference between price based promotion and non-price based promotion.

CO (1,4) (L-2) **3**

UNIT-I

Q.2   What is the primary role of statistics in predictive analytics?   [CO: 1, L-1] **15**

Q.3   When dealing with a continuous variable, what is the appropriate statistics calculation?

[CO: 1, 2 L-1] **15**

UNIT-II

Q.4   How modelling technique is used to predict corona virus trends in future?

[CO:2,1 L-3] **15**

Q.5   Find the trend of production by the method of a five-yearly period of moving average for the following data:

Years	2018	2019	2020	2021	2022
Production	126	119	128	118	117

[CO (3) L-2] **15**

UNIT-III

Q.6   Discuss the Predictive analytics for promotion and price optimization.   [CO:2,1 L-4] **15**

Q.7   Discuss the Predictive Models with the ROC (receiver operating characteristic) Curve.

[CO:3,1 L-4] **15**

UNIT-IV

Q.8   Write a short note on 'adoption predictive analytics and machine learning in healthcare'.

[CO:2,1 L-3] **15**

Q.9   Give an example of stock price prediction using KNN algorithm.   [CO (3,4) L-2] **15**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
COMMUNICATION SYSTEMS-II (EC-622)

Time: 3 hrs

Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all.* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer the following briefly:
- a) What is MSK modulation scheme?
- b) If the encoding bits/sample in PCM is increased from 6 bits to 8 bits, what will be the increase in SNR?
- c) Find the Nyquist rate and the Nyquist internal for the signal

$$x(t) = \frac{1}{2\pi} \cos\left(4000\pi t\right) \cos\left(1000.\pi t\right)$$
.
- d) For a signal of bandwidth 3 kHz and SNR of 15, Calculate the channel capacity.
- e) State and explain source coding theorem.
- f) Define 'bit rate' and 'baud rate'.
- g) List the limitations in Delta modulation.
- h) Compare different types of sampling.
- i) Define 'entropy'.
- j) Write different elements of PCM.   **2x10**

PART-A

Q.2 a) What are different pulse modulation techniques? What is the difference between PAM and PTM?   **10**
   b) Describe the difference between uniform and non-uniform companding.   **5**
   c) Find out the following for a audio signal with bandwidth of 20 kHz and digitally encoded using PCM.
   - i) Nyquist rate.
   - ii) If the Nyquist samples are quantized into 256 levels, determine the number of binary digits required to encode the quantized samples.
   - iii) Determine the maximum bandwidth required to transmit the encoded signal. **5**

Q.3 a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection.   **10**
   b) State the difference between coherent and non-coherent detection.   **5**
   c) What do you mean by M-ary signalling? List any two advantages of QPSK over BPSK?   **5**

Q.4 a) What is matched filter? Give expression for probability of error of matched filter.**10**
   b) What is an optimum filter? Derive the expression for probability of error, Pe and transfer function of optimum filter.   **10**

PART-B

Q.5 a) Consider the four messages x1, x2, x3, x4. Let they have probabilities

End Semester Examination, May 2022
B. Tech. – First/Second Semester
PROFESSIONAL COMMUNICATION – I /
PROFESSIONAL COMMUNICATION (HM-104/HM-204)

Time: 2 hrs.   Max Marks: **50**
No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Explain the concept of communication with examples of different types of communication.   **20**

PART-A

Q.2   What do you understand by non-verbal communication? Explain with examples.
                                                                       [CO-2] [L-1] **5**

Q.3   How would you describe good and effective communication?   [CO-2] [L-1] **5**

Q.4   What are the greatest challenges to good communication?   [CO-3] [L-1] **5**

PART-B

Q.5   What is the purpose of e-mail in business communication?   [CO-1] [L-1] **10**

Q.6   Can culture, gender, nationality or social class have an effect on communication?
                                                                       [CO-3] [L-1] **10**

Q.7   Define 'barriers in communication'. Give example.   [CO-2] [L-1] **10**

End Semester Examination, May 2022
B. Tech. — Sixth Semester
FRENCH-II (HM-606)

Time: 1½ hrs.

Max Marks: **50**

No. of pages: 4

Note: *Attempt* **ALL** *questions are* **compulsory**. *Marks are indicated against each question.*

Section-A
(Compréhension d'Écrite)

Q.1 **Lisez le texte et répondez aux questions suivantes.**   [CO5][L2,5]
(Read the text & respond to the questions)

> Il y a une fille. Elle s'appelle Sylvie. Elle est belle et gentille. Elle a
> une petite salle de jeux (play room). Dans sa salle, Il y a des jouets.
> Il y a une voiture, il y a un avion. Elle a aussi un aquarium. Dans
> l'aquarium, il y a deux poissons (fish). Ils sont gros. Sylvie aime les
> poissons. Elle a aussi un chat. Il s'appelle Kitty. Sylvie aime sa salle
> de jeux.

a) Dites vrai ou faux.
(Say True or False)

  i.)   Sylvie a une salle de jeux   _____

  ii.)   Il y a un robot dans sa salle   _____

  iii.)   Elle a trios poissons   _____

  iv.)   Le chat de Sylvie s'appelle Kitty.   _____   **1x4**

b) Répondez aux question par une phrase complète.
(Respond to the questions)

  i.)   Comment s'appelle la fille ?

  _____ .

  ii.)   Décrivez la jeune fille.

  _____ .   **1x2**

Section B
(Production Écrite)

Q.2 **Décrivez votre journée ou Décrivez votre saison préférée (Describe your day
or Describe your favrouite season)**

End Semester Examination, May 2022

B. Tech. — Sixth Semester
GERMAN-II (HM-607)

Time: 1½ hrs.

Max Marks: **50**

No. of pages: 3

Note: *Attempt* **ALL** *questions are* **compulsory**. *Marks are indicated against each question.*

Q.1 **Ergänzen Sie bitte den richtigen Artikeln (der, die oder das) und übersetzen Sie die Wörter auf Englisch.**
(Write the definite article and translate the given words in English.)   [CO3,5] [L1, 4]

a) _____ Park   -   _____

b) _____ Lampe   -   _____

c) _____ Fisch   -   _____

d) _____ Sonne   -   _____

e) _____ Wind   -   _____

f) _____ Buch   -   _____

g) _____ Bleistift -   _____

h) _____ Badzimmer -   _____

i) _____ Drucker   -   _____

j) _____ Bett   -   _____   **10**

Q.2 **Ergänzen Sie die Gegenteile!**
(Fill in the blanks with suitable opposites.)   [CO3] [L3, 4]

a) Mein Wohnzimmer ist **hell**, aber mein Schlafzimmer ist _____.

b) Die Lehrerin ist nicht **unfreundlich**. Sie ist sehr _____.

c) Im Sommer ist es sehr **heiß**. Im Winter ist es _____.

d) Das Kind ist nicht **dumm**. Er ist sehr _____.

e) Ich bin **motiviert**. Mein Freund ist _____.   **1x5**

Q.3 **Lesen Sie den Text und beantworten die folgenden Fragen zum Text.**
(Read the given passage and answer the following questions in one sentence.)   [CO5] [L-1]

End Semester Examination, May 2022
B. Tech. — Sixth Semester
SPANISH-II (HM-608)

Time: 1½ hrs.

Max Marks: **50**

No. of pages: 5

Note: *Attempt* **ALL** *questions are* **compulsory**. *Marks are indicated against each question.*

Q.1 **Lee el texto y responde a las preguntas.** [CO5][L1]
Read the text and respond to the questions.

¿Qué tal? Me llamo Rohan. Yo soy moreno, alto, ni bajo, soy normal. Tengo el pelo corto y ondulado. Llevo gafas. En mi universidad tengo muchos amigos. Yo amo a una chica. Se llama Dristi. Ella es rubia, gorda y alta. Ella tiene ojos cortos y marrones. Ella tiene el pelo largo y rizado. En nuestro tiempo libre nos gusta jugar al fútbol, ver nuevas películas, leer novelas, salir con amigos. En sabado nosotros salimos con nuestros amigos para comprar, comer diferente comidas, jugar etc. En domingo nostros estudiamos.

a) ¿Cómo se llama el chico?
b) ¿Cómo es la chica?
c) ¿Qué hacen ellos en su tiempo libre?
d) ¿Qué hacen con sus amigos?
e) Busca un verbo y hace una frase. **1x5**

Q.2 **Lee el texto y responde a las preguntas.**
Read the text and answer true or false.

¡Hola! Yo soy Anjela. Mi hermano se llama Pablo. Su edad es 12 años. Él habla cuatro lenguas hindi, chino, español y un poco de italiano. Él también aprende inglés. Mi mejor amiga y mi hermano estudian en misma (same) escuela. Mi mejor amiga se llama María y ella tiene 16 años. Ella es muy guapa y estudiosa. Ella también habla cuatro lenguas. Nosotros vemos películas juntos. Yo amo a mi amiga mucha.

Verdadero o falso:

a) Pablo habla español un poco. _____.
b) El hermano de Anjela es Pablo. _____.
c) María y Pablo no estudian en misma escuela. _____.
d) Anjela y María tienen 16 años. _____.
e) La mejor amiga de Anjela es guapa y estudiosa. **1x5**

Q.3 **Arrastra las respuestas correctas para completar el diálogo.** [CO5][L4]
Choose the correct answers to complete the dialogue.

End Semester Examination, May 2022
B. Tech. – First /Second Semester
ENGLISH (HSMC-101/111)

Time: 1½ hrs.   Max Marks: **50**

No. of pages: 2

Note: *Attempt any* **TWO** *questions from* **PART-A** *and* **PART-B. PART-C is compulsory.** *Marks are indicated against each question.*

PART-A

Q.1   What is a presentation? Write five steps for preparing an effective presentation. How will presentation skills be beneficial to your area of profession in particular?

[CO4][L1] **20**

Q.2   What do you understand by SWOT? Explain with your self-assessment.   [CO5][L1] **20**

Q.3   What are the barriers to effective communication? Explain in detail.   [CO5][L1] **20**

PART-B

Q.4   Write a letter to your mentor requesting for attendance for April 09, 2022 as you were attending 'Zenith' event in your college.   [CO2][L1] **20**

Q.5   What are the smart goals? Why should we set goals? Explain five principles of goal setting.   [CO5][L1] **20**

Q.6   Write an email to your head of department asking for annual appraisal. Discuss the project you performed in relevance of company growth and your appraisal.

[CO2][L1] **20**

PART-C

Directions for Q7 to Q9: Choose the word or group of words which is most opposite in meaning to the word printed in bold.   [CO-5] [L-1]

Q.7   **Ecstasy**
       a) Hate   b) Agony   c) Fatigue   d) Languor

Q.8   **Flaunt**
       a) Regard   b) Sink   c) Hide   d) Propose

Q.9   **Aversion**
       a) Avoidable   b) Awareness   c) Hatred   d) Affection

Directions for Q10 to Q12: Choose the word most similar in meaning to the given word.

[CO-5] [L-1]

Q.10   **Fiasco**
       a) Festival   b) Disaster   c) Happenstance   d) Ceremony

Q.11   **Stigma**

End Semester Examination, May 2022
B. Tech. – Fourth Semester
JAVA PROGRAMMING (IT-402)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory.** *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
- a) Enumerate two situations in which static methods are used.
- b) Consider a loan processing system in a bank. Identify the classes and objects in the system and list them.
- c) Mention the purpose of the keyword 'final'.
- d) What is the significance of an abstract class?
- e) What are proxies? How are they advantageous?
- f) How to run a JAR file through command prompt?
- g) What is instance of keyword?
- h) Can we declare a class as static?
- i) Can we overload a main method?
- j) Why java is not pure object oriented language?   **2×10**

PART-A

Q.2   a) Write a program to create a package calculator and import it to another class to perform mathematical operations like multiply and divide.   **10**

     b) Write a program for constructor overloading and method overloading.   **10**

Q.3   a) Write a Java program which creates human face.   **8**

     b) What is a package? How do we design a package in Java? Explain by taking an example.   **12**

Q.4   a) Differentiate between frame and panel in awt? Write a program to create a smiley face with "Happy Birthday" displayed in a frame.   **10**

     b) Write a program to display mouse related events. Also discuss event handling in detail.   **10**

PART-B

Q.5   a) Define 'Multithreading'. Give an example of an application that needs multithreading.   **10**

     b) How to set priorities for threads? Discuss with an appropriate program.   **10**

Q.6   a) Discuss RowSet and write steps for updating value in the database using cached RowSet.   **10**

     b) Write a program to select id, name, age of an employee whose id = 15 and 20, using prepared statement.   **10**

Q.7   a) Explain the steps to create RMI based clients and server. Explain the various methods for registering and gaining access to remote object.   **10**

     b) Explain the reason to implement a corba application with multithreading.   **10**

End Semester Examination, May 2022
B. Tech. – Second Semester
APPLIED MECHANICS (M-201)

Time: 3 hrs. Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1 Answer in brief:
   a) Define 'impulse momentum principle'.
   b) Discuss about instantaneous center of rotation.
   c) Differentiate between 'determinate' and 'indeterminate' structure.
   d) Why I section is more efficient in structure?
   e) What is Radius of Gyration?
   f) Define "principle of transmissibility of a force, with example."
   g) Write general equations of static equilibrium.
   h) What is the difference between moment of a force and couple?
   i) Define 'parallel axis theorem'.
   j) Differentiate between 'rectilinear Motion' and 'curvilinear Motion'. **2x10**

PART-A

Q.2 a) State and prove Varignon's Theorem. **10**
   b) Determine the x and y scalar components of F_1, F_2, and F_3 acting at point A of the bracket as shown in the figure.
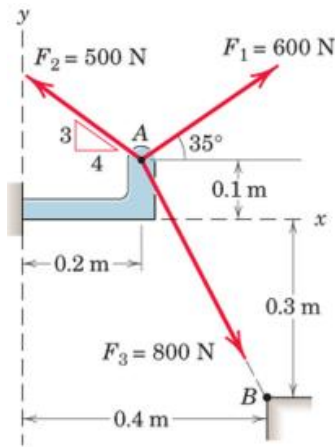
10

Q.3 a) State and prove theorem of perpendicular axis. **10**
   b) Determine the centroid of the laminaas shown in the figure.

10
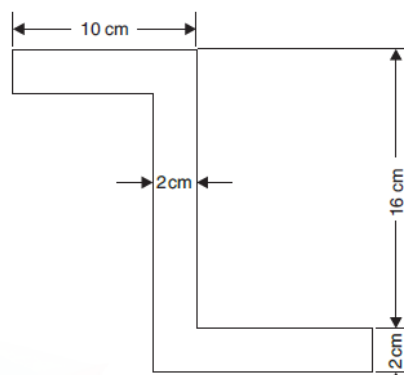
End Semester Examination, May 2022

M. Tech. – Second Semester

ADVANCED PLANT BIOTECHNOLOGY (MBT-201)

Time: 3 hrs. *Max Marks:* **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt at least* **ONE** *question from each* **UNIT**. *Marks are indicated against each question.*

Q.1 Answer briefly:
  a) How is callus different from other plant tissue?
  b) How is rooting induced in in-vitro regenerated shoots?
  c) Differentiate between 'somatic' and 'zygotic' embryos.
  d) Highlight the importance of totipotency in plant tissue culture.
  e) Why plant breeding is dependent on genetic variation?
  f) Identify the uses of triploids.
  g) Enumerate the functions of secondary metabolites in plants.
  h) Mention the advantages of marker assisted selection.
  i) Why is it important to conserve germplasm.
  j) Distinguish between 'Landraces' and Wild relatives'. [CO- 1] [L-1] **2x10**

UNIT-I

Q.2 a) Examine the mechanism of somatic embryogenesis. [CO-1] [L-4] **10**

  b) Organize the sequence of events in in-vitro fertilization. [CO-1] [L-3] **10**

Q.3 a) Evaluate the efficiency of different methods of single cell culture. [CO-2] [L-5] **10**

  b) Design a suitable bioreactor for scale-up of plant cell culture. [CO-2] [L-6] **10**

UNIT-II

Q.4 a) Demonstrate the biosynthesis pathway of a secondary metabolite. [CO-3] [L-2] **10**

  b) Illustrate the process of mass propagation of plants. [CO-3] [L-3] **10**

Q.5 Design a strategy to elicit the production of secondary metabolites in plant tissue cultures. [CO-4] [L-6] **20**

UNIT-III

Q.6 a) Identify the mechanisms of plant germplasm conservation. [CO-5] [L-3] **10**

  b) Analyze the advantages and disadvantages of in-situ and ex-situ germplasm conservation methods. [CO-5][L-4] **10**

Q.7 Give an evaluative account of policy framework for access and exchange of plant genetic resources. [CO-6] [L-5] **20**

End Semester Examination, May 2022
M. Tech. – Second Semester
ADVANCED ENVIRONMENTAL BIOTECHNOLOGY (MBT-202)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all.* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer in brief:
 a) Why is it important to test water quality parameters?
 b) Define Lagoons and analyze their role in waste water treatment.
 c) How is eutrophication related to algal blooms?
 d) Define 'hyperaccumulators' with examples.
 e) What does IUCN Red List stand for?
 f) Comment on the limitations of phytoremediation.
 g) What do you mean by accelerated bioremediation?
 h) Analyze the oligodynamic effect of metals.
 i) What are the risks associated with genetically modified organisms (GMOs)?
 j) Enlist various problems arising from overexploitation of natural resources.   **2x10**

PART-A

Q.2 Differentiate between primary, secondary and tertiary waste water treatment.
 [CO-1] [L-2] **20**

Q.3 Give a detailed account of cleaner technologies used for treatment of **any two** of the following:
 a) Textile industry waste.
 b) Dairy Industry waste.
 c) Paper and pulp industry waste.   [CO-2] [L-1] **10x2**

Q.4 a) Identify the factors influencing bioremediation.   [CO- 3] [L-3] **5**
 b) Explain the different types of in situ technologies of bioremediation with the help of a flow chart.   [CO- 3] [L-3] **5**
 c) How is remediation of pollutants brought about by using plants? Identify various mechanisms involved in phytoremediation with their significance.   [CO- 4] [L-3]**10**

PART-B

Q.5 a) Summarize the various toxic influences of metals on microbial cell. [CO-4] [L-2] **10**
 b) Enlist the ways in which microbes interact with metals? Compare the different mechanisms of metal resistance.   [CO-4] [L-4] **10**

Q.6 a) Describe the concept and principles of Sustainable Development.   [CO-5] [L-2] **10**
 b) Discuss in detail the concept of bioprospecting and biopiracy.   [CO-5] [L-1] **10**

Q.7 a) What is the importance of biodiversity and how it can be conserved?
 [CO-6] [L-1] **10**
 b) Convention of Biodiversity promotes nature's well-being. Justify the statement.

End Semester Examination, May 2022

M. Tech. (Biotechnology) – Second Semester

STEM CELLS BASED TISSUE DEVELOPMENT (M-BT-224)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1 Answer in brief:
  a) Define the term iPSC. State the characteristics of stem cells.   [CO-1] [L-1]
  b) How stem cell could be use in wound healing?   [CO-1] [L-3]
  c) Name some growth factors and determine their significance.   [CO-2] [L-2]
  d) What is an artificial liver?   [CO-4] [L-4]
  e) Determine the main components used for building cellular tissue.   [CO-3] [L-3]
  f) Explain how do cells adhere to extracellular matrix.   [CO-5] [L-2]
  g) Evaluate the major cell adhesion molecules and adhesion receptors.   [CO-5] [L-5]
  h) Discuss the tissue biomechanics.   [CO-6] [L-2]
  i) Analyze the importance of good animal model handling.   [CO-6] [L-4]
  j) Discuss the need and use of stem cell-based tissue development.   [CO-3] [L-3]
                                                                                2x10

PART-A

Q.2 a) Discuss in detail about artificial liver and artificial bone.   [CO-1] [L-2] **10**
  b) Explain the role of stem cells in the regeneration of lung and skin.   [CO-1] [L-3] **10**

Q.3 Evaluate the unique characteristics of stem cells. Determine the properties and application of embryonic, adult, iPSC and mesenchymal stem cells.   [CO-2] [L-5] **20**

Q.4 a) Explain extra cellular matrix (ECM) and its significance. How can cells interact with the extracellular environment?   [CO-3] [L-2] **10**
  b) Discuss the biomedical applications of stem cells with suitable examples.

                                                                             [CO-3] [L-3] **10**

PART-B

Q.5 Illustrate cell adhesion molecules (CAM) and the significance of their interactions with the extracellular environment. How CAM could be use in neural regeneration with the help of stem cell therapy?   [CO-4] [L-4] **20**

Q.6 a) Determine the purpose and problems associated with tissue engineering. Mention the things required for tissue engineering.   [CO-5] [L-3] **10**
  b) Evaluate the need of an animal model in tissue engineering? Mention the procedure for handling the animal model.   [CO-6] [L-5] **10**

Q.7 Discuss in detail about the FDA regulation in stem cell therapy. Also mention the ethical issues with stem cell therapy with suitable reference example.   [CO-6] [L-2] **20**

End Semester Examination, May 2022

M. Tech. – Second Semester
STEM CELLS THERAPY (M-BT-229)

Time: 3 hrs.   Max Marks: **100**
No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt atleast* **ONE** *question from each* **UNIT**. *Marks are indicated against each question.*

Q.1   Answer the following briefly.
    a) Define stem cells and their types.   [CO-2] [L-1]
    b) What you understand by the term hematopoiesis?   [CO-1] [L-2]
    c) How stem cell transplant is done?   [CO-3] [L-3]
    d) Illustrate the complications that could occur due to stem cell transplantation.
                                                                          [CO-4] [L-4]
    e) How stem cells are used in gene therapy?   [CO-4] [L-2]
    f) Discuss the sources of stem cell therapy for cardiac repair.   [CO-3] [L-3]
    g) Contrast between Type-I and Type-II Diabetes.   [CO-5] [L-3]
    h) Evaluate the ethics of destroying human embryos for research.   [CO-5] [L-3]
    i) Determine the social and ethical issues of stem cells.   [CO-6] [L-3]
    j) Analyze the negative effects of stem cell therapy.   [CO-6] [L-4] **2×10**

UNIT-I

Q.2   a) Explain the preparation required before stem cell transplantation. Differentiate between Autologous Transplantation and Allogenic Transplantation with example.
                                                                [CO-2] [L-3] **10**
    b) Illustrate the conditions where bone marrow transplantation is required. How are the stem cells harvesting? Also discuss different types of bone marrow transplantation.   [CO-1] [L-4] **10**

Q.3   a) Evaluate the condition in which umbilical cord blood could be collected. Determine its application in medicine.   [CO-2] [L-5] **10**
    b) Discuss in detail about stem cell banking process steps and its significance.
                                                                [CO-1] [L-3] **10**

UNIT-II

Q.4   a) Evaluate different modes of delivery of stem cells in the stem cell therapy for the cardiac repair.   [CO3] [L-5] **10**
    b) Explain cystic fibrosis. How stem cell therapy could be use in cystic fibrosis.
                                                                [CO3] [L-3] **10**

Q.5   Determine the cause and new strategies for the treatment of Diabetes.
                                                                [CO-4] [L-3] **20**

UNIT-III

Q.6   a) Explain the ethics of destroying human embryos for research and the using embryonic stem cells in research.   [CO-6] [L-6] **10**
    b) Illustrate the process of establishing the new embryonic cell lines from frozen embryos.   [CO-5] [L-4] **10**

End Semester Examination, May 2022
M. Tech. – Second Semester
ENGLISH FOR RESEARCH PAPER WRITING (M-MC-002)

Time: 2 hrs.   Max Marks: **50**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Marks are indicated against each question.*

Q.1   Answer **any two** of the following:
a) How to write a title.
b) How to avoid ambiguity in a research paper.
c) Useful phrases.   [CO-3] [L-4] **5×2**
d) Plagiarism.

Q.2   What are the skills required to write a good literature review paper?   [CO-2] [L-1] **10**

Q.3   Write an abstract for a potential research paper.   [CO-3] [L-2] **10**

Q.4   Describe about the way of planning and preparation for a dissertation.
[CO-1] [L-3] **10**

Q.5   Define ways to structure a paragraph while writing a research paper.
[CO-4] [L- 2] **10**

Q.6   How to ensure that the paper you are writing is of a good quality?   [CO-5] [L-1] **10**

Q.7   Write an introduction of any potential research paper you might be writing.
[CO-3] [L-5] **10**

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1 a) Solve: $\dfrac{dy}{dx} + P(x)y = Q(x)$

b) Solve: $\left(\sec x \tan x \tan y - e^x\right)dx + \sec x \sec^2 y \; dy = 0$

c) Find C. F. for the differential equation $y'' + 4y = 0$.

d) Find P.I. for the differential equation $\left(D^2 - 4D + 3\right)y = x^2$.

e) Form the partial differential Equation: $xyz = \phi(x + y + z)$.

f) Solve: $p - q = x - y$

g) Evaluate $\displaystyle\int_0^\infty \dfrac{e^{-t} - e^{-3t}}{t}\,dt$

h) Find the Inverse Laplace transform $\dfrac{e^{-\pi s}}{s^2 + 2^2}$

i) In the Fourier series expansion of $f(x) = x^2$ in $(-\pi, \pi)$, what is the value of b_n?

j) A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is _____. **2x10**

PART-A

Q.2 a) Solve the following differential equations:
$(y^4 + 2y)\,dx + (xy^3 + 2y^4 - 4x)\,dy = 0$ [CO-1] [L-2]**10**

b) $\dfrac{dy}{dx} + x^2 y = \sin x$ [CO-1] [L-2] **10**

Q.3 a) Solve $\dfrac{d^2 y}{dx^2} + a^2 y = \sec ax$.   [CO-2] [L-3]**10**

b) Solve $\dfrac{d^2 y}{dx^2} + \dfrac{dy}{dt} - 2y = \sin t, \quad \dfrac{dx}{dt} + x - 3y = 0$ [CO-2] [L-3] **10**

Q.4 a) Solve the following differential equations:
$\left(x^2 - y^2 - z^2\right)p + 2xyq = 2xz$ [CO-3] [L-3] **10**

b) A string of length l is initially at rest in equilibrium position and each of its points is given the velocity $\left(\dfrac{\partial y}{\partial t}\right)_{t=0} = b \sin^3 \dfrac{\pi x}{l}$. Find the displacement y(x, t).

[CO-3] [L-3] **10**

PART-B

End Semester Examination, May 2022
B. Tech. – Third Semester
APPLIED MATHS-III (MA-302)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1   a) Prove that $i^i = e^{-(4n+1)\frac{\pi}{2}}$.   [CO-1][L-4] **2**

b) Show that $lt(z \to 0) \dfrac{\text{Re}(z)^2}{|z|^2}$ does not exist.   [CO-1][L-4] **2**

c) Find residues of $f(z) = \dfrac{e^z}{(z-2)^3}$ inside circle of radius 2.   [CO-2][L-3] **2**

d) Expand $f(z) = \sin z$ in Taylor's series about $z = \dfrac{\pi}{4}$.   [CO-2][L-2] **2**

e) Find the Fourier sine transform of $f(x) = \dfrac{1}{x}$.   [CO-3][L-2] **2**

f) Six cards are selected from a well- shuffled deck of playing cards. Given that all the six cards are black, find the probability that they are all from the same suit?
[CO-4][L-2] **2**

g) The standard deviation of the heights of 16 male students chosen at random in a school of 1000 male students is 2.40 in. Find the (a) 95% and (b) 99% confidence limits of the standard deviation for all male students at the school.   [CO-5][L-2] **3**

h) What are the normal equations to fit a straight line?   [CO-6][L-1] **2**

i) Covariance between x and y is 10. Also the variances of x and y are 16 and 9 respectively. Find the coefficient of correlation.   [CO-6][L-1] **3**

PART-A

Q.2   a) If $\sin(A+iB) = x+iy$, prove that: $\dfrac{x^2}{\cosh^2 B} + \dfrac{y^2}{\sinh^2 B} = 1$ [CO-1][L-3] **10**

b) Determine analytic function $f(z) = u+iv$ whose imaginary part is
$e^{-x}(x\cos y + y\sin y)$.   [CO-1][L-3] **10**

Q.3   a) Expand the function in Laurent's Series $f(z) = \dfrac{1}{z(e^z - 1)}$ for $0 < |z| < 2\pi$.

[CO-2][L-5] **10**

b) Evaluate $f(z) = \displaystyle\int_C \dfrac{e^z}{\cos \pi z} dz$ where C: |z|=2.   [CO-2][L-5] **10**

Q.4   a) Express $f(x) = e^{-ax}$ as Fourier sine integral.   [CO-3][L-5] **10**

b) Find the Fourier cosine transform of the $\dfrac{1}{x(x^2 + a^2)}$.   [CO-3][L-3] **10**

End Semester Examination, May 2022
M. Sc. (Applied Geology) – Fourth Semester
REMOTE SENSING AND GIS (MAG-DS-401)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 a) Why is water blue?
   i) Because the atmosphere absorbs light corresponding to green and red wavelengths.
   ii) Because blue light has smaller wavelengths than red and green light.
   iii) It absorbs red, yellow and green light, but scatters blue light
   iv) Because water absorbs shorter wavelengths more than longer wavelengths.

b) The altitudinal distance of a geostationary satellite from the earth is about:
   i) 26,000 km
   i) 30,000 km
   iii) 36,000 km
   iv) 44,000 km

c) Remote sensing techniques make use of the properties of _____ emitted, reflected or diffracted by the sensed objects:
   i) Electric waves
   ii) Sound waves
   iii) Electromagnetic waves
   iv) Wind waves

d) Which statement below is NOT correct?
   i) Geostationary orbits typically have a rotation time of 90 min.
   ii) Communication satellites typically use geostationary orbits.
   iii) Geostationary orbits rotate at the same speed as the earth.
   iv) Polar orbits give varying coverage depending on latitude.

e) Relief distortion depends on which of the following?
   i) Zenith
   ii) Flying height
   iii) Datum
   iv) Focal length

f) Which of the following effect do NOT result in geometrical errors/distortion in satellite images?
   i) Earth curvature
   ii) Earth rotation
   iii) Atmospheric absorption
   iv) Sensor platform motion
   v) Local topography

g) In visible region, the blue light is having a wave length range of _____.
   i) 0.42-0.52 micrometer
   ii) 0.24-0.52 micrometer
   iii) 0.42-0.92 micrometer
   iv) 0.22-0.32 micrometer

h) Which type of EMR is useful for rock study?
   i) Microwave
   ii) Ultraviolet
   iii) Visible Range
   iv) None of these

i) Which of the following field is used by the EM waves?
   i) Solar field
   ii) Polarized field
   iii) Electric field
   iv) Micro field

j) What is GIS?
   i) Geo-information selection
   ii) Geographical information system
   iii) geological information system
   iv) None of these   **2x10**

End Semester Examination, May 2022
M. Sc. (Applied Geology) – Fourth Semester
ADVANCE ECONOMIC GEOLOGY (MAG-DS-402)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Briefly discuss the following:
   a) Strategic minerals.   [L3][CO-5]
   b) Evolution textures in ores.   [L3][CO-3]
   c) Mn Nodules.   [L4][CO-6]
   d) Stable isotopes in ores.   [L6][CO-3] **5x4**

PART-A

Q.2   a) Discuss different modes in which ore bodies occur. Give typical modes of hydrothermal ores.   [L5][CO-1] **10**
   b) Describe three textures seen ores of magmatic/ hydrothermal origin.

[L5][CO-1]**10**

Q.3   a) Discuss the structure and stratigraphic controls on ore deposition with sketches.

[L5][CO-2] **10**
   b) Which ore minerals are associated with maffic and ultramaffic rocks?

[L2][CO-2] **10**

Q.4   a) Discuss "Inversion points" with respect to ore mineralization.   [L3][CO-3] **10**
   b) Discuss the process of orthomagmatic ore deposition with suitable examples.

[L4][CO-3] **10**

PART-B

Q.5   a) Discuss the Chromite and PGE deposits.   [L4][CO-4] **10**
   b) Discuss the ore deposits associated with sedimentary rocks and processes.

[L4][CO-3] **10**

Q.6   a) With suitable diagrams describe various mining methods and criterion of selection.

[L6][CO-5] **10**
   b) Discuss the Indian National Mineral Policy.   [L4][CO-5] **10**

Q.7   a) Elaborate the surveys and guides associated with geochemical and geobotanical prospecting.   [L6][CO-6] **10**
   b) Explain the methods of concentrating the ores.   [L5][CO-6] **10**

End Semester Examination, May 2022
M. Sc. (Applied Geology) – Fourth Semester
QUATERNARY GEOLOGY (MAG-DS-404)

Time: 1½ hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B.** Marks are indicated against each question.*

Q.1   Answer the following:
   a) Differentiate between chronostartigraphy and magnetostartigraphy.   [L1][CO-1]
   b) Advantage of OSL dating?   [L6][CO-2]
   c) Describe two landfroms of glacial origin.   [L5][CO-3]
   d) Why more deltas are developed on eastern coast of India, Discuss?   [L6][CO-6]
                                                                            5x4

PART-A

Q.2   a) Give startigraphic subdivisions and important climatic events of Quaternary time.
                                                                         [L2][CO-1] **10**
   b) Which dating technique you will choose to date a fossil bearing Holocene bed? Give reasons in support of your answer.   [L5][CO-1] **10**

Q.3   a) What do you understand by neotectonism? Give five manifestations of neotectonic effects on rock formations.   [CO-2] [L2] **10**
   b) Why Holocene is important for palaeoclimatic studies.   [L6][CO-2] **10**

Q.4   a) Evaluate the criterion to distinguish palaeosoils. What are the significance of palaeosoils in Quaternary geology?   [CO-3] [L3] **10**
   b) What are the lithological characters of moraines? How they are useful in palaeoclimatic reconstruction?   [CO-4] [L3] **10**

PART-B

Q.5   a) Discuss the role of pollen and diatoms in Quaternary climate an stratigraphy.
                                                                         [L5][CO-5] **10**
   b) Explain the evolution of man from Cro Magnon (Homo Sapiens) onward.
                                                                         [L5][CO-4] **10**

Q.6   a) Discuss the importance and inferences drawn from the ice cores? Which areas you will suggest for ice core drilling?   [L6][CO-5] **10**
   b) Evaluate the marine startigraphy of Indus Fan or Ganga fan.   [L6][CO-5] **10**

Q.7   a) Give the stricture of the Himalaya and discuss its evolution. [L6][CO-6] **10**
   b) What were the main causes of disintegration of Harappan / Indus civilization?
                                                                         [L5][CO-6] **10**

End Semester Examination, May 2022
M. Tech. – Second Semester
NUMERICAL METHODS IN CIVIL ENGINEERING (MCE-201)

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　Max Marks: **100**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1　a)　Briefly explain the numerical method developed by Carl Friedrich (1777-1855)?
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-1] [L1]
　　b)　What was the unique about the method given by Philip Ludwig von seidel?
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-1] [L1]
　　c)　Explain transcendental Equations?　　　　　　　　　　　[CO-2] [L2]
　　d)　Differentiate between diagonal matrix and unit matrix?　　[CO-2] [L3]
　　e)　Explain linear interpolation of data?　　　　　　　　　　[CO-2] [L2]
　　f)　Where do we use Romberg's method?　　　　　　　　　　[CO-5] [L2]
　　g)　Write Picard Second approximation equation?　　　　　　[CO-5] [L2]
　　h)　Explain Simpson's 3/8 rule?　　　　　　　　　　　　　　[CO-5] [L2]
　　i)　What do you understand by outgoing variables?　　　　　[CO-5] [L2]
　　j)　Enlist the steps of dual simplex method?　　　　　[CO-5] [L1] **2×10**

PART-A

Q.2　a)　The amount A of a substance remaining in a reacting system after an interval of time in a certain chemical experiment is tabulated below. Obtain the value of A where t = 9 using Newton's backward interpolation formula.

t (min)	2	5	8	11
A (gm)	94.8	87.9	81.3	75.1

　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-3] [L3] **10**
　　b)　Using Gauss's forward interpolation formula, find the value of loag 337.5 from the following table:

x	310	320	330	340	350	360
y_x	2.4914	2.5052	2.5185	2.5315	2.5441	2.5563

　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-2] [L3] **10**

Q.3　Solve the following equation by Newton-Raphson method.
　　　　　　　　$x^3+2x^2+10x-20=0$　　　　　　　　　[CO-4] [L4] **20**

Q.4　Find the solution of the equations by Gauss - Jordan method:
　　　　　　　　　　　　　　　　　　　　　　　　　　　　[CO-5] [L5] **20**

　　　　　　　$10x+y+z=12, 2x+10y+z=13$ and $x+y+5z=7$

PART-B

Q.5　a)　Explain Gaussian Integration method　　　　　　　　[CO-5] [L3] **10**
　　b)　Evaluate the following using Gaussian formula for n=2 and n=3.

End Semester Examination, May 2022
M. Tech. – Second Semester
FEM IN STRUCTURAL ENGINEERING (MCE-SE-201)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer in brief:
   a) Define the term "Finite Element Modelling".   [CO-1] [L-1]
   b) List the various steps involved in the Finite Element Analysis.   [CO-1] [L-2]
   c) What do you understand by the term "Discretization"?   [CO-2] [L-2]
   d) Distinguish between "Natural Discretization" and "Artificial Discretization".
                                                                       [CO-2] [L-2]
   e) State "Euler – Lagrange Equation" under Galerkin's Method of Elasticity.
                                                                       [CO-3] [L-1]
   f) Justify the importance of Principle of Minimum Potential Energy in FEA.[CO-3] [L-2]
   g) What do you understand by the term "Stiffness Matrix"?   [CO-1] [L-2]
   h) Summarize the characteristics of Shape Functions.   [CO-4] [L-2]
   i) Evaluate $\int L_1 L_2^2 L_3^3 .dA$.   [CO-4] [L-2]
   j) What do you understand by QST?   [CO-5] [L-2] **2×10**

PART-A

Q.2 Plan a mechanism to justify "The First Variance of the functional for stational value yields Euler – Lagrange's Equation; Kinematics Boundary Condition and Natural Boundary Conditions."   [CO-1] [L-5] **20**

Q.3 a) Justify the significance of Rayleigh – Ritz Method in FEM.   [CO-2] [L-3] **5**

   b) By using Rayleigh – Ritz Method, evaluate the bending moment and deflection at the mid – span of a simply supported beam of span 'L' subjected to a UDL 'w' over its entire span.   [CO-2] [L-4] **15**

Q.4 Plan a mechanism to determine the various stages involved in the determination of deflection by using flexibility matrix method.   [CO-3] [L-5] **20**

PART-B

Q.5 Plan a mechanism to determine shape function for the following elements:
   a) 4 – Noded Rectangular Element.
   b) 8 – Noded Rectangular Element.   [CO-4] [L-5] **10x2**

Q.6 a) Elaborate in detail the different factors considered while analyzing discretization process.   [CO-4] [L-3] **10**
   b) With the help of neat sketches, classify elements used in FEM on the basis of their shapes.   [CO-4] [L-3] **10**

End Semester Examination, May 2022

M. Tech. - Second Semester
STRUCTURAL DYNAMICS (MCE-SE-202)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer in brief:
- a) Write briefly any real case study where dynamic forces on the structure damaged it. [CO1] [L-1]
- b) What are the Dynamic forces resisted by a typical suspension bridge. [CO1] [L-2]
- c) What is the initial condition for the free vibrations in MDOF? [CO2] [L-2]
- d) Define Frequency ratio. Find the frequency ratio if forcing frequency is 209.4 and natural frequency is 178.9. [CO2] [L-2]
- e) When is the phenomena of resonance occur in terms of frequency ratio? [CO6] [L-2]
- f) What are the factors on which Response Spectra depends? [CO3] [L-3]
- g) What is the maximum base moment if the pseudo spectral acceleration is 0.4g and column height is 3.0m. [CO4] [L-4]
- h) Compute the time period for SDOF system for a mass of 3000kg and column stiffness of 100kN/m. [CO3] [L-4]
- i) Define Deformation response factor. [CO6] [L-2]
- j) Describe various methods of discretization analysis of dynamic problem.
  [CO-2] [L-2] **2x10**

PART-A

Q.2 a) State D' Alembert's Principle and signify its use in the FBD. [CO-1] [L-2] **6**
   b) Develop expression for response of damped SDOF system to free vibration.
   [CO-1] [L-4] **14**

Q.3 A Machine of 1.5 tonnes weight is placed on a concrete plank of width 600mm and length 2m and thickness 150mm. Evaluate the static and dynamic deflection of the machine running at 2000 rpm. Use M20. [CO-4] [L-4] **20**

Q.4 a) A water tank is set to vibrate freely. Amplitude of vibration reduces from 0.5m to 0.1m in 4 cycles in 8 seconds. Find the damped natural period and damping.
   [CO-4] [L-4] **6**
   b) Discuss briefly Duhamel's Integral. [CO-6] [L-4] **14**

PART-B

Q.5 Determine the range of natural frequency of the given building for the particular mode shape using approximate methods of Rayleigh and Dunckerly:
M1 = M2=M3=1562.5 kg
k1 = k2=k3=22.35 X 106 N/m
The mode shape is given as [1; 0.80; 0.44]. [CO-5] [L-3] **20**

Q.6 a) Discuss tripartite plot. [CO-5] [L-3] **6**

End Semester Examination, May 2022
B. Tech. – Second Semester
ADVANCED STEEL DESIGN (MCE-SE-203)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1 Answer in brief:
  a) As per the codal guidelines, describe"Soft Storey" and "Short Columns". [CO-4] [L-1]
  b) Explain how steel stress-strain curve is distinguished from concrete stress-strain curve.   [CO-1] [L-2]
  c) What are the deflection limits for the following cases?   [CO-3] [L-3]
     i) Fixed beam with UDL throughout its span.
     ii) Simply Supported beam with UDL throughout its span.
  d) Contrast between buckling and crippling.   [CO-2] [L-2]
  e) Justify "*Effective length of columns with one end fixed and other end free is 2L*".
                                                                                 [CO-4] [L-3]
  f) What do you understand by "Radius of Gyration"?   [CO-4] [L-2]
  g) Explain the design philosophies for structures.   [CO-5] [L-2]
  h) Sketch the legends for shop rivets and field rivets for the following: [CO-6] [L-3]
     i) Countersunk farside rivets.
     ii) Countersunk both sides rivets.
  i) Write down a simple procedure for the design of fillet welds as per Codal provisions.
                                                                                 [CO-6] [L-2]
  j) Describe plastic design of beams.   [CO-5] [L-1]
                                                                                 2x10

PART-A

Q.2 a) Write a detailed note on Erection loads and temperature effects on considerations for the purpose of steel structural design."   [CO-1] [L-2] **8**
  b) Differentiate between hot rolled and cold formed steel and highlight their importance in steel design and construction. List out the different sections normally used in steel construction.   [CO-1] [L-2] **12**

Q.3 a) Determine the plastic moment capacity and plastic section modulus of the following sections:
     i) (ISMB 450) about z-z axis.
     ii) Unsymmetrical I-section (assume dimensions).   [CO-2] [L-4] **8**
  b) Check for shear, deflection, web buckling and web crippling while determining the UDL carrying capacity of the welded plate girder with specification as: (depth of web is 700 mm, flange width is 150mm, thickness of flange and web is 14mm), when it is used as a cantilever beam of 4m effective span. Assume stiff bearing length as 100 mm.   [CO-2] [L-5] **12**

Q.4 Symmetric truss of span 20 m and height 5 m are spaced at 4.5 m centre to centre. Design channel section to be placed at 1.4 m distance to resist the following loads:
  • Weight of sheeting including bolts= 171 N/m^2

End Semester Examination, May 2022
M. Tech. – Second Semester
DESIGN OF ADVANCED CONCRETE STRUCTURES (MCE-SE-207)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
   a) Explain the basic sources of building load.   [CO-1] [L-1]
   b) Give a brief account on the additional loads that must be incorporated while designing a structure.   [CO-1] [L-2]
   c) Define "Corbel". Lay out a framework for design of corbels.   [CO-2] [L-1]
   d) List the parameters influencing the design of deep beams.   [CO-2] [L-2]
   e) State the working mechanism of a Shear wall? When will you consider the use of shear walls?
   f) Differentiate between flat plate and flat slab system.   [CO-3] [L-2]
   g) As per revised IS code, "torsional reinforcement is now not required to be worked out separately from that required for bending and shear". Justify briefly.
   h) Define "Factor of Safety". What necessitates the use for the factor of safety?
[CO-5] [L-2]
   i) As per eurocode, define the two cases of fatigue load that are considered in design.   [CO-6] [L-1]
   j) List the parameters that causes significant effect on fatigue resistance of the structures.   [CO-6] [L-2] **2x10**

PART-A

Q.2   a) Explain the different design philosophies used in structural engineering*.*
[CO-1] [L-2] **10**
   b) "*No load by itself is static or dynamic but the action of which will determine it.*" Explain the statement in detail.   [CO-1] [L-3] **10**

Q.3   a) Write a detailed note on the classifications of structural system.   [CO-2] [L-2] **8**
   b) Assuming a 40-grade concrete and Fe415 steel, design a simply supported transfer girder of 5.5 m length loaded from two columns at 1.8m from each end with 4000 kN. The total depth of the beam is 4.3 m and the width of support is 52 cm. (Sketch the arrangement of the design).   [CO-2] [L-5] **12**

Q.4   a) Draft a procedure for design of tension member for steel structures. [CO5] [L5] **10**
   b) With proper sketch, explain in details the different failures of a structural joint in steel design.   [CO-5] [L-3] **10**

PART-B

Q.5   a) Draft a note on the compression field theory for shear design.   [CO-3] [L-2] **8**
   b) Assuming F_{ck}= 25 and f_y=415 N/mm^2, design a shear wall of length 5 m and thickness 250mm subject to the following forces (the wall is a high wall) with the following loadings.

End Semester Examination, May 2022
M. Tech. – Second Semester
GEOMETRIC DESIGN OF STREETS AND HIGHWAYS
(MCE-TE-201)

Time: 3 hrs.   Max Marks: **100**

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:

a) Specify the value of ruling gradient recommended by IRC for plain roads.
                                                                      [CO1, L-1]
b) Write minimum and maximum super elevation.   [CO2, L-1]
c) On what factors the width and layout of urban road cross-section depend?
                                                                      [CO2, L-2]
d) What are objectives of providing camber?   [CO3, L-2]
e) What is desirable width as per IRC for median on rural roads?   [CO3, L-2]
f) What is an ideal transition curve?   [CO4, L-2]
g) Mention various elements included in the road margins.   [CO3, L-2]
h) Under what conditions capacity flow is reached?   [CO3, L-2]
i) Write advantages of traffic rotary in particular reference to traffic conditions in India.   [CO5, L-1]
j) Rotaries are not suitable for every location, justify the statement.   [CO3, L-3]

                                                                        2×10

PART-A

Q.2   a) What are the factor controlling geometric design elements? Explain in detail.
                                                                   [CO1,L-2] **10**
b) Explain what are the important pavement surface characteristics wrt highway geometric design?   [CO1, L-2] **10**

Q.3   a) Calculate the overtaking sight distance for a design speed of 96kmph. Assume all suitable data.   [CO2, L-5] **10**
b) What are the factors on which super elevation depends? Explain.   [CO2, L-2] **10**

Q.4   a) Give descriptive notes on: i) Road Margins ii) Right of way iii) Traffic separators.
                                                                   [CO3, L-2] **15**
b) With the help of neat sketch explain typical cross sections of a typical urban arterial road.   [CO3, L-2] **5**

PART-B

Q.5   a) What are effects of design speed on horizontal alignment design? What are the design speeds for different classes of roads specified by IRC?   [CO4, L-2] **10**
b) Explain level of service concept while deciding the design capacity of a road.
                                                                   [CO3, L-2] **10**

End Semester Examination, May 2022
M. Tech. – Second Semester
INTELLIGENT TRANSPORTATION SYSTEM (MCE-TE-202)

Time: 3 hrs. Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer in brief:
  a) Give the application areas of Intelligent Transport System. [CO4, L-2]
  b) Explain the working of detectors that help in regulating the traffic flow. [CO2, L-1]
  c) Define RFID system used in automatic vehicle identification. [CO3, L-2]
  d) How road side communication helps in transmitting the information. [CO4, L-2]
  e) Explain the term dynamic road message sign and its importance. [CO4, L-2]
  f) Write the importance of advanced public transportation System. [CO5, L-2]
  g) Explain the benefits of advanced vehicle safety system in brief. [CO1, L-2]
  h) Describe the importance of Traffic Management Centers (TMC) in handling traffic congestion in brief. [CO3, L-2]
  i) Write down the components of AVL system. [CO4, L-2]
  j) Write down the different benefits of electronic payment. [CO1, L-1] **2×10**

PART-A

Q.2 a) Explain the function of main component of ITS in detail. [CO1] [L-2] **10**
  b) ITS helps in reduction of accidents and traffic congestion. Justify this statement with some examples of developed countries. [CO6] [L-3] **10**

Q.3 a) Is your car or vehicle stolen and is not visible among the several cars present? Which technology of ITS can help you to find your car, discuss it in detail. [CO1] [L-4] **10**
  b) Highway maintenance management can be better harnessed using GIS. Justify this statement. [CO 2] [L-4] **10**

Q.4 a) Discuss various emerging techniques for wireless vehicular communications. [CO 3] [L-2] **10**
  b) Explain the various parameters on which functioning of traffic management center depends. [CO 3] [L-2] **10**

PART-B

Q.5 a) Discuss the advanced rural transportation systems (ARTS) in detail and its benefits to the society. [CO 5] [L-2] **10**
  b) Advanced Traffic Management System (ATMS) helps to reduce the traffic accidents. Justify this statement with some examples of developed country. [CO 4] [L-2] **10**

Q.6 a) Explain the functioning of Commercial Vehicle Operation (CVO) in managing the manoeuver of commercial vehicle. [CO 4] [L-2] **10**

End Semester Examination, May 2022

M. Tech. – Second Semester

HIGHWAY SUB-GRADE AND FOUNDATION ANALYSIS (MCE-TE-203)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:

    a) Give group symbol for soil passing 4.75mm sieve 70%, passing 75-micron sieve 18%, Liquid limit 40% and plastic limit 22%.   [CO-1] [L-3]

    b) What are essential requirements of a good drainage system?   [CO-3] [L-1]

    c) What causes change in moisture content?   [CO-3] [L-3]

    d) A clayey soil has MDD of $16kN/m^3$ and OMC 12%. A contractor during the construction of core of a highway obtained dry density of $15.2kN/m^3$. Comment whether this construction is acceptable or not.   [CO-2] [L-4]

    e) What are the types of Rollers used for compaction?   [CO-2] [L-2]

    f) What is utility of Standard Proctor Test?   [CO-2] [L-2]

    g) Write relation between bulk density and dry density.   [CO-2] [L-2]

    h) Classify geo-synthetics on the basis of their method of manufacturing.   [CO-5] [L-2]

    i) Mention application areas for the use of earth reinforcements.   [CO-5] [L-1]

    j) Name different stages of consolidation.   [CO-4] [L-1]

                                                               2x10

PART-A

Q.2   a) Discuss soil survey procedure for highways.   [CO-1] [L-3] **10**

    b) Discuss characteristics of various soils pertinent to roads and airfields.

                                                              [CO-1] [L-4] **10**

Q.3   a) Elaborate which materials are considered to be unsuitable for embankment construction and why?   [CO-2] [L-3] **5**

    b) Give step by step procedure of classification of a soil by AASHTO and Federal system.   [CO-2] [L-3] **15**

Q.4   a) What is objective of providing subsurface drainage? Discuss methods adopted for sub surface drainage.   [CO-3] [L-3] **10**

    b) Discuss in detail various defects of highways due to improper drainage.

                                                              [CO-3] [L-3] **10**

PART-B

Q.5   a) Define and explain what is meant by 'compaction', and how is it controlled in the field?   [CO-4] [L-5] **10**

    b) Write notes on i) factors affecting compaction ii) effect of compaction on the soil properties.   [CO-4] [L-4] **10**

Q.6   a) Define and explain the following, indicating the symbols used and their relationship with other important parameters i) Time factor ii) Coefficient of consolidation iii) Degree of consolidation iv) Compression index v) Coefficient of compression.

                                                              [CO-5] [L-2] **10**

End Semester Examination, May 2022
M. Tech. – Second Semester
ADVANCED DESIGN OF BRIDGES (MCE-TE-208)

Time: 3 hrs.   Max Marks: **100**
No. of pages: 2

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
  a) List the six basic forms of bridge structure.   [CO-1] [L-2]
  b) Classify bridges on the basis of their function.   [CO-1] [L-2]
  c) What are the various factors on which width of carriageway depends? [CO-2] [L-1]
  d) With the help of a neat sketch, illustrate the loading condition of a tracked vehicle of IRC Class 70R loading.   [CO-2] [L-3]
  e) Define "Culvert".   [CO-3] [L-1]
  f) Evaluate the impact factor for IRC Class AA loading for tracked vehicle if the effective span of the bridge is 7 m.   [CO-3] [L-4]
  g) Compare "Substructure" and "Superstructure" in context to bridge structure.
                                                                                       [CO-4] [L-2]
  h) List the various loads considered in designing of a Pier.   [CO-5] [L-2]
  i) Justify the importance of bearings in the bridge structure.   [CO-5] [L-3]
  j) Explain the importance of conducting inspection of various bridge elements.
                                                                               [CO-6] [L-2]**2x10**

PART-A

Q.2   a) With the help of a neat sketch, illustrate the different components of a bridge structure.   [CO-1] [L-3] **10**
      b) Elaborate "economical span of a bridge" in detail.   [CO-1] [L-3] **10**

Q.3   Write a explained note on "IRC Live Loads".   [CO-2] [L-3] **20**

Q.4   Design the Deck Slab for a Reinforced Concrete Slab Culvert, having following data:
  • Clear Span of bridge   : 8 m
  • 2 – Lane width Roadway
  • 1.0 m footpaths on either side of roadway
  • Wearing Coat   : 90 mm
  • Width of bearing   : 450 mm
  • IRC Class AA – Tracked Vehicle
  • M 25 grade concrete and Fe 415 Steel   [CO-3][L-6] **20**

PART-B

Q.5   a) With the help of a neat sketch, illustrate the various shapes of Piers.
                                                                                       [CO-4] [L-3] **8**
      b) Analyze the stresses acting on a Pier Structure for the following data:
  • Simply Supported T – Beam Bridge Deck
  • Dead Load from each span   : 3500 kN
  • Reaction due to Live Load   : 1200 kN
  • Total height of Pier   : 10 m

End Semester Examination, May 2022
M. Tech. – Second Semester
ADVANCE ALGORITHM (MCS-201)

Time: 3 hrs.   Max Marks: **100**
                                                                            No. of pages: 2

Note: *Attempt any* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1   a) Consider the following Graph:
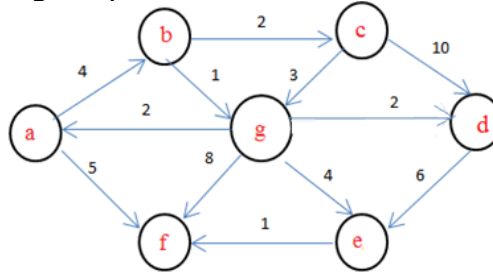
   If b is the source vertex, what is the minimum cost to reach f vertex? Also write
   the Psuedocode for Dijikstra's algorithm.   [CO-2] [L-3] **12**
   b) Write the algorithm which uses Divide and Conquer strategy.   [CO-1][L-1] **8**

Q.2   a) Find the minimum spanning tree (MST) for the given graph using Kruskal's
   Algorithm
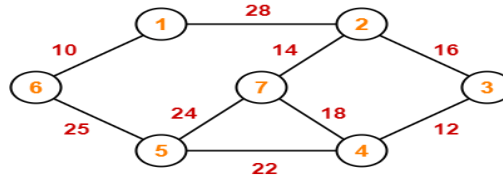
   Also discuss the complexity.   [CO- 3] [L-4] **12**
   b) Differentiate between Prim's and Krushkal's algorithm.   [CO-2][L-2] **8**

Q.3   a) Explain in detail Strassen's algorithm with the help of an example. [CO-2] [L-2] **10**
   b) Find the determinant of 3 × 3 matrices and then find its minor, cofactors and adjoi
   and insert the results in the inverse matrix formula given below:

   $$A^{-1} = \frac{1}{|A|} Adj(A)$$

   Where |A| ≠ 0   [CO-4][L-3] **10**

Q.4   a) Explain the characteristics of dynamic programming. Write Floyd Warshall's
   algorithm for finding shortest path.   [CO- 4] [L- 2] **10**
   b) State Chinese Remainder Theorem and explain its application with the help of an
   example.   [CO- 4] [L- 1] **10**

Q.5   a) Why the randomized algorithms are needed? Write the randomized quick sort
   algorithm.   [CO-2] [L-1] **10**
   b) Analyze the complexity of Quick Sort in best case, average case and worst case.
                                                                      [CO-3][L-4] **10**

Q.6   a) Trace the steps of insertion sort – 19,26,40,33,36,42,29. Find the total number of
   comparison made.   [CO-1][L-3] **10**
   b) Differentiate Breadth First Search and Depth First Search   [CO-4][L-2] **10**

End Semester Examination, May 2022
M. Tech. – Second Semester
SOFT COMPUTING (MCS-202)

Time: 3 hrs.   Max Marks: **75**

No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1   Answer the following:
  a) Differentiate between supervised and unsupervised learning.
  b) Give an example where you must follow soft computing methods instead of hard computing. Justify your answer.
  c) Briefly explain population based incremental learning.   **5x3**

Q.2   Implement AND, OR, NOT, NAND and NOR logic functions using McCulloch Pitts neuron model.   **15**

Q.3   a) What is Fuzzy Inference System (FIS)? Illustrate Mamdani FIS and Sugeno FIS with examples.   **10**
  b) Explain the different methods for fuzzy approximate reasoning.   **5**

Q.4   a) A(x)={(x1,0.1),(x2,0.3),(x3,0.5),(x4,0.8)} B(y)={(y1,0.4),(y2,0.6),(y3,0.3)}
      Find the Cartesian product of these two fuzzy sets.   **5**
  b) List five consumer products in which fuzzy logic is used. Illustrate how fuzzy logic is used in these appliances?   **5**
  c) Explain properties of fuzzy control.   **5**

Q.5   a) What is deep learning? Differentiate between deep and shallow network.   **8**
  b) Explain the process of LSTM.   **7**

Q.6   a) Define a perceptron. Draw its mathematical model. Obtain the output of perceptron model with inputs as [x1,x2,x3]=[0.8,0.6,0.4] and the weights as [w1,w2,w3]=[0.1,0.3,-0.2] with bias= 0.35. Use unipolar and bipolar binary activation function.   **8**
  b) Discuss the back propagation algorithm with the help of suitable example.   **7**

Q.7   a) Explain four mutation methods in genetic algorithm.   **5**
  b) Describe any three stopping conditions for genetic algorithm flow.   **5**
  c) Explain any three crossover techniques employed in genetic algorithms with the help of examples.   **5**

Q. 8 a) Explain the flow of neural network model design in MATLAB   **8**
  b) Write a short note on 'CNN'.   **7**

End Semester Examination, May 2022
M. Tech. - Second Semester
COMPUTER VISION (MCS-223)

Time: 3 hrs   Max Marks: **100**

No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1 a) Demonstrate the importance of computer vision. Mention the various steps involved in the computer imaging system. [CO-1] [L-3] **10**

b) Show the effectiveness of the image formation, sensing, and processing in image analysis. [CO-1] [L-2] **10**

Q.2 a) Describe the purpose of Edge Detection. Also, discuss the functionalities of Canny edge detection with an example. [CO-2] [L-2] **10**

b) Acknowledge the effectiveness of the Hough Transformation for detecting circles in an image. [CO-2] [L-2] **10**

Q.3 a) Illustrate the Role of Morphological operations. Write a program in python to show the role of different morphological operators. [CO-2] [L-3] **10**

b) Write a Program in Python to demonstrate the importance of thresholding, segmentation, blurring, and smoothing operations in image analysis. [CO-3] [L-3] **10**

Q.4 a) Describe with an example how the rotation, scaling, and arithmetic operators help in image processing. [CO-3] [L-2] **10**

b) Give all the step involved in the Convolution methodology, and explain each. [CO-3] [L-2] **10**

Q.5 a) Emphasize the purpose of Feature Extraction. State how feature analysis plays an important role in computer vision. [CO-4] [L-3] **10**

b) Differentiate between PCA, LDA, and ICA. [CO-5] [L-4] **10**

Q.6 a) Demonstrate the principle of KNN-based image classification. [CO-5] [L-3] **10**

b) Summarize the importance of clustering in image segmentation. [CO-5] [L-3] **10**

Q.7 a) Demonstrate the importance of computer vision in biometrics. Explain the fingerprint-based employee identification system. [CO-6] [L-3] **10**

b) Show the effectiveness of computer vision technology in computational photography. [CO-6] [L-2] **10**

Q.8 Describe the following terms:

a) Fourier Transform.

b) Data Preprocessing.

c) Activity Recognition.

d) Corner Detection. [CO-2,3,6] [L-2] **5x4**

End Semester Examination, May 2022
M. Tech. – Third Semester
ADHOC NETWORKS (MCS-227)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1   Answer in brief:
    a) TCP does not perform well in Adhoc Wireless Networks. Justify.   [CO-1] [L-2]
    b) What is the need for cross layer design in Adhoc Networks?   [CO-2] [L-2]
    c) Differentiate between 'proactive' and 'reactive' routing protocols.   [CO-3] [L-2]
    d) Explain the need to integrate Adhoc networks with mobile IP.   [CO-4] [L-2] **5×4**

Q.2   a) Explain Key management in Adhoc Wireless Networks.   [CO-1] [L-2] **10**
    b) Discuss the major challenges a routing protocol faces in Adhoc Wireless Networks.
             [CO-1] [L-2] **10**

Q.3   a) How the cross layer techniques optimize the routing in Adhoc Wireless Networks?
             [CO-2] [L-2] **10**
    b) How to update the routing table in table driven routing protocol.   [CO-2] [L-2] **10**

Q.4   a) List out the issues of transport layer protocol design for Adhoc wireless networks.
             [CO- 3] [L-2] **10**
    b) Describe IEEE Standard 802.15 in detail.   [CO-3] [L-2] **10**

Q.5   a) Discuss the Pros and Cons of a routing protocol that uses GPS information for an
       Adhoc wireless Network during search and rescue operation.   [CO-4] [L-2] **10**
    b) Explain in detail about contention based protocols with reservation. [CO-4] [L-2] **10**

Q.6   a) Classify routing protocols of wireless networks based on the routing information
       update mechanism.   [CO-5] [L-2] **10**
    b) Discuss in brief any one hierarchical routing protocol of wireless Adhoc networks.
             [CO-5] [L-2] **10**

Q.7   a) Explain the multicast zone routing protocol.   [CO-6] [L-2] **10**
    b) Explain the three phases of ABR Protocol.   [CO-6] [L-2] **10**

Q.8   a) Discuss dynamic source routing protocol in Adhoc Wireless network.[CO-3][L-2] **10**
    b) Explain split-TCP   [CO-6][L-2] **10**

End Semester Examination, May, 2022

M. Tech. - Second Semester
RTL SIMULATION AND SYNTHESIS WITH PLD'S (MEC-153)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1 a) Discuss the architecture of FPGA in detail.   [CO-2][L2] **10**
      b) Explain Static Timing analysis and its relevance in detail.   [CO-4][L4] **10**

Q.2 a) What are HDL simulators? What is the difference between blocking and non-blocking in Verilog?   [CO-4][L2] **10**
      b) What do you understand by Sensitivity list?   [CO-3][L1] **5**
      c) What are the main differences between Wire and Reg?   [CO-3][L2] **5**

Q.3 a) What is Design for testability in VLSI? Explain different levels of testing.   [CO-2][L3] **10**
      b) Briefly explain the ASIC design flow.   [CO-2][L4] **10**

Q.4 a) Discuss clock tree synthesis in detail along with its impact on VLSI design.   [CO-1][L6] **10**
      b) What are PLDs? Explain briefly different types of PLDs.   [CO-2][L2] **10**

Q.5 a) Differentiate between Mealy type FSM and Moore type FSM.   [CO-1][L5] **10**
      b) What is Intellectual Property with reference to VLSI? Explain its different categories.   [CO-2][L2] **10**

Q.6 a) Explain the following: ESD protection and SoC.   [CO-1][L2] **10**
      b) What is the need for multi clock domain designs? Briefly highlight its design strategies.   [CO-1][L6] **10**

Q.7 Write short notes on:
      a) Low Power VLSI Design Techniques.   [CO-1][L3] **10**
      b) TOP-down approach to VLSI design.   [CO-1][L3] **10**

End Semester Examination, May 2022
M. Tech. - Second Semester
ANALOG AND DIGITAL CMOS VLSI DESIGN (MEC-253)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1 a) Explain the structure of MOSFET. Differentiate between 'PMOS' and 'NMOS'.
[CO-1][L1] **10**

b) Discuss VTC of CMOS inverter in detail and write its SPICE code. What are the alternatives forms of pull up that can be used in an inverter?   [CO-4][L3] **10**

Q.2 a) Explain the following with example and SPICE code: CMOS Transmission Gate Logic, Pass Transistor Logic.   [CO-4][L2] **10**

b) What are the various sources of power dissipation in CMOS?   [CO-1][L2] **10**

Q.3 a) Explain in detail about the short channel effects in MOSFET and its impact on the device performance.   [CO-1][L4] **10**

b) Discuss the structure and operating principle of a Tunnel FET device. Discuss the factors that affects the subthreshold swing of a TFET device.
[CO-2][L3] **10**

Q.4 a) Explain single stage CS amplifier in detail.   [CO-3][L1] **10**

b) What is Gilbert Cell? Design a Gilbert Cell using transistor and explain its functionality.   [CO-3][L6] **10**

Q.5 a) What is the purpose of using current mirror in an electronics circuit? Explain different forms of current mirror that are widely used.   [CO-3][L2] **10**

b) Design a source follower circuit using FET and explain its operation in detail.
[CO-2][L6] **10**

Q.6 a) Draw the circuit of CS stage amplifier with triode load and explain its operation.   [CO-3][L3] **10**

b) Explain different sources of noise that exist in electronic devices.
[CO-1][L5] **10**

Q.7 Write short notes on:
a) Slew rate and PSRR.   [CO-1][L4] **10**
b) Two stage OPAMP.   [CO-1][L4] **10**

End Semester Examination, May 2022

M. Tech. – Second Semester

SENSOR APPLICATIONS IN MANUFACTURING (MEEIR-201)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all; Marks are indicated against each question.*

Q.1   a) Enumerate the characteristics of transducers and discuss how we can classify them.   [CO 1[L-2] **10**
       b) What is meant by signal processing and conditioning? Discuss the basic principles of analog signal conditioning techniques.   [CO 1[L-3] **10**

Q.2   a) Recall the concept of inductive transducer and discuss LVDT in detail.
                                                                            [CO 2[L-3] **10**
       b) List and explain different types of photo sensors used in the manufacturing industries.   [CO 2[L-4] **10**

Q.3   a) Explicit the modes of detection used by sensors and explain each.   [CO 1[L-2] **10**
       b) Discuss the concept of laser production. Also, enumerate the characteristics of lasers and types of laser sensors.   [CO 1][L-2] **10**

Q.4   a) Discuss the Fuzzy logic approach for the opt-electronic color sensor in manufacturing.   [CO 2][L-4] **10**
       b) Discuss the techniques employed analog to digital conversions.   [CO 2][L-4] **10**

Q.5   a) Enumerate the robot vision task and deliberate the mechanism to detect partially visible objects.   [CO 3][L-2] **10**
       b) Deliberate multi-objective approach for selection of sensors in manufacturing.
                                                                            [CO 3][L-2] **10**

Q.6   a) Discuss the operation of semiconductor absorption sensors employed in manufacturing industries.   [CO 4][L-2] **10**
       b) Enumerate temperature detectors using point-contact sensors in process manufacturing plant.   [CO 4][L-2] **10**

Q.7   a) Enumerate tracking- the mean time between operations interventions, tracking the yield and mean process time.   [CO 5][L-2] **10**
       b) Enumerate the mechanism Network of Sensors detecting machinery fault.
                                                                            [CO 5][L-2] **10**

Q.8   Explain the terms:
       a) Cryogenic manufacturing applications.
       b) Detection of machining faults.   [CO 2][L-5] **10x2**

End Semester Examination, May 2022
M. Tech. – Second Semester
ROBOTICS FOR INDUSTRIAL AUTOMATION (MEEIR-202)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all. Marks are indicated against each question.*

Q.1   a) What are the different classifications of robots?   [CO1, L2] **10**
      b) Differentiate repeatability and accuracy of robot.   [CO1, L2] **10**

Q.2   What is a robot gripper? Explain the different grippers used in robot industry.
                                                                                    [CO1, L2] **20**

Q.3   a) Explain stepper motor drive used as actuator in robots.   [CO2, L2] **10**
      b) Compare different types of drive systems used in robot.   [CO2, L2] **10**

Q.4   Explain any two tactile and two non -tactile sensors used in robots.   [CO2, L2] **20**

Q.5   a) Explain D-H notation of link parameters.   [CO3, L2] **10**
      b) What are steps involved in trajectory planning?   [CO3, L2] **10**

Q.6   a) Differentiate point to point control and continuous path control.   [CO4, L2] **10**
      b) Explain the classification of programming languages based on level.   [CO4, L2] **10**

Q.7   Explain any four applications of robots in manufacturing industry.   [CO2, L2] **20**

End Semester Examination, May 2022

M.TECH. - Second Semester

INTERNET OF THINGS (MEEIR-252)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: Attempt any **FIVE** questions in all. Marks are indicated against each question.

Q.1   a) Describe the relative strength and limitation of Building IOT with RASPERRY PI.
                                                                          [CO-2] [L2] **10**
     b) Examine whether M2M and IoT are same.   [CO-1] [L2] **5**
     c) Explain different Data types with example in python.   [CO-3] [L2] **5**

Q.2   a) Design the protocol layer of IoT and explain various protocols used in each layer.
                                                                          [CO-2] [L6] **10**
     b) Illustrate the IOT-levels for designing different IOT Applications.   [CO-2] [L3] **10**

Q.3   a) Why Software Defined Networks (SDN) is preferred over Conventional Network Architecture (CNA).   [CO-1] [L3] **10**
     b) Explain IOT system management with NETCONF-YANG model.   [CO-1] [L2] **10**

Q.4   a) Differentiate between a python module and a package. Also write down a python program to find out current year, month, date and day using time module.
                                                                    [CO-3] [L3] **10**
     b) Write down a program to open a URL in python program using URLLib module.
                                                                     [CO-3] [L3] **10**

Q.5   a) Compare and contrast the similarities and dissimilarities of SPI and I2C interfaces on Raspberry Pi.   [CO-4] [L4] **10**
     b) Write down a program in python language to blink a LED connected on Raspberry Pi board.   [CO-4] [L3] **10**

Q.6   a) Explain Web Application Messaging Protocol (WAMP).   [CO-5] [L2] **10**
     b) Elaborate the term Amazon Web Services (AWS). List out various domains of AWS and discuss atleast one service from each domain.   [CO-5] [L1] **10**

Q.7   a) What is the purpose of an Amazon Auto scaling group? Describe the steps involved in creating an Auto scaling group.   [CO-5] [L1] **10**
     b) Formulate the significant use of Raspberry Pi in Smart cities and Industrial appliances.   [CO-4] [L1] **10**

Q.8   a) Differentiate between NFV and SDN.   [CO-4] [L3] **8**
     b) Why python is most popular programming language. Explain its features also.
                                                               [CO-3] [L1] **6**
     c) Define IoT and M2M. State the Characteristics of IoT and M2M and illustrate the difference between IoT and M2M.   [CO-1] [L2] **6**

End Semester Examination, May 2022
M. Tech. – Second Semester
ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS IN AUTOMATION
(MEEIR-253)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer following in brief:
  a) Why do we need Artificial Intelligence?   [CO-1] [L-1]
  b) What are the types of AI?   [CO-1] [L-2]
  c) Give a brief introduction to the Turing test in AI?   [CO-2] [L-1]
  d) What is an 'agent'?   [CO-4] [L-2]
  e) What is the significance of knowledge representation?   [CO-4] [L-2]
  f) What are the issues in knowledge representation in artificial intelligence?
                                                                       [CO-3] [L-3]
  g) Differentiate between object and event.   [CO-4] [L-1,2]
  h) Where is Bay's theorem used in real life?   [CO-3] [L-1]
  i) Explain domain and tuple.   [CO-1] [L-4]
  j) List applications of frame.   [CO-1] [L-4] **2x10**

PART-A

Q.2   a) How artificial intelligence, machine learning, and deep learning differ from each other?   [CO-1] [L-3] **10**
  b) Explain the concept of rationality. How it can be applied in AI?   [CO-1] [L-1] **10**

Q.3   What are different types of uninformed search strategies? Explain in detail with example.   [CO-2] [L-2] **20**

Q.4   a) Explain the nature of heuristics with example. What is the effect of heuristics accuracy?   [CO-3 L2] **10**
  b) Explain Semantics of Bayesian Networks.   [CO-4,L3] **10**

PART-B

Q.5   a) What are the key takeaways of quantifying uncertainty?   [CO-5][L-2] **10**
  b) What are the properties of knowledge representation systems?   [CO-3][L-3,2] **10**

Q.6   a) What is meant by Bayes theorem in probability? How it is different from conditional probability? What are its applications?   [CO-4] [L-3] **10**
  b) A college found in its survey that mobility of a population from village to town and city is as:

	Village	Town	City
Village	60%	25%	15%
Town	10%	70%	20%
City	10%	40%	50%

End Semester Examination, May 2022

B. Tech. – Sixth Semester
PRESS TOOLS-I (MII-601)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 3

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1 a) Which of these is not a part of stamping press?
   i) Clutch
   ii) Injection nozzle
   iii) Ram   [CO-1] [L2]
   b) A ram comes to its highest position at:
   i) TDC with slide adjustment up
   ii) TDC with slide adjustment down
   iii) BDC with slide adjustment down   [CO-2] [L3]
   c) Shut height is the distance between Ram and Bolster when Slide is at:
   i) BDC with slide adjustment down
   ii) BDC with slide adjustment up
   iii) TDC   [CO-1] [L2]
   d) The clutch joins the following: i. link motor and flywheel.
   i) Flywheel and crankshaft
   ii) Crankshaft and ram   [CO-3] [L2]
   e) Columns are used to:
   i) Guide the slide
   ii) Act as housing
   iii) Locate the bolster   [CO-2] [L2]
   f) Stroke length is the distance between:
   i) Slide and bolster at TDC
   ii) Slide and bolster at BDC
   iii) TDC and BDC   [CO-3] [L2]
   g) One line – multiple presses are feature of a:
   i) Transfer Press
   ii) Press Line
   iii) Neither of the two   [CO-6][L3]
   h) The distinctive feature of a Link Drive press is:
   i) Slow approach fast retract
   ii) Fast speed throughout
   iii) Slow speed throughout   [CO-4][L2]
   i) Web thickness depends upon:
   i) Size of the part
   ii) Thickness of sheet
   iii) Both i and ii   [CO-2][L2]
   j) In case of piercing, the piercing hole size is equal to:
   i) Die block opening size
   ii) Punch size
   iii) Neither of the two   [CO-3][L2]
   k) Cutting clearance depends upon:

End Semester Examination, May 2022

B. Tech. – Sixth Semester

CAD-II (MII-602A)

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　　Max Marks: **100**

No. of pages: 3

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **PART-A** and **TWO** questions from **PART-B**. Marks are indicated against each question.*

Q.1　Choose correct option in following multiple choice questions:

a)　What is G0 continuity?
　　i)　Point continuity　　　　ii)　Tangential continuity　　iii)　Curvature continuity
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.1.1}

b)　How do you join two curves in sketcher mode:
　　i)　Join command　　　　ii)　Connect command　　iii)　Profile command

c)　In sketcher mode, you have circle, you want to make 4 copies in a straight line at uniform pitch, you will use:
　　i)　Mirror command　　　　ii)　Move command　　　iii)　Translate command
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.2.1}

d)　To give taper to one side of a rectangular block, use:
　　i)　Angle command　　　　ii)　Draft angle command　iii)　Slope command
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.2.1}

e)　To cut a surface with a another surface, use:
　　i)　Trim command　　　　ii)　Split command　　　iii)　Break command
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.2.1}

f)　To create thickness of a surface, use the following command:
　　i)　Offset　　　　　　　ii)　Solid　　　　　　　iii)　Thick surface
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.2.1}

g)　To make a square cavity in a solid, use:
　　i)　Pocket command　　　　ii)　Slot command　　　iii)　Hole command
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.3.1}

h)　To make a solid hollow, use the following command:
　　i)　shell　　　　　　　　ii)　skin　　　　　　　iii)　hollow　{MII.604.3.1}

i)　To make a new plane, parallelto an existing plane, use the following command:
　　i)　plane - offset
　　ii)　Plane through two lines
　　iii)　plane-normal/angle to plane　　　　　　　　　　　　　{MII.604.3.1}

j)　Following command is used to add two solids:
　　i)　Boolean – assemble　　ii)　Boolean - Remove　　iii)　Boolean – trim
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.3.1}

k)　To clamp a portion of a model in FEA, use:
　　i)　Fix command　　　　ii)　Clamp command　　iii)　Both　{MII.604.3.1}

l)　To assign the properties of steel or copper to a model, use command:
　　i)　change property　　　ii)　apply material　　iii)　neither of the two
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　{MII.604.3.1}

m)　To check interference in an assembly model, use:
　　i)　Interference command　　ii)　intersect command
　　iii)　clash command　　　　　　　　　　　　　　　　　　　{MII.604.3.1}

End Semester Examination, May 2022
B. Tech. (Industry Integrated) – Sixth Semester
WELDING TECHNOLOGY (MII-603)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:
    a) Define 'roll forming'.   [CO-1][L-1]
    b) Define 'wipe bending'.   [CO-1][L-1]
    c) Write down the features of sheared edge of work.   [CO-1][L-2]
    d) What is cut-off and parting operation?   [CO-2][L-2]
    e) What is the function of flash back arrestor?   [CO-1][L-1]
    f) Define 'soldering and brazing'.   [CO-2][L-2]
    g) Write down the limitations of TIG welding.   [CO-1][L-1]
    h) What are the advantages of GTAW?   [CO-2][L-1]
    i) Define 'dye penetrate test'.   [CO-1][L-2]
    j) Define 'soldering process'.   [CO-2][L-1]
                                                                                   2x10

PART-A

Q.2   Explain plasma cutting process with a neat sketch. Discuss its advantages and disadvantages in detail.   [CO-3, 5][L-3] **20**

Q.3   Explain various metal cutting methods in detail.   [CO-2, 4][L-4] **20**

Q.4   Explain carbon arc welding process with a neat sketch. Discuss its advantages, limitations and applications in detail.   [CO-3, 4][L-3] **20**

PART-B

Q.5   Write the working principle and application of GMAW welding with a neat diagram.
                                                                          [CO-4, 5][L-5] **20**

Q.6   Discuss the various Non–Destructive methods of testing of welds.
                                                                          [CO-2, 3][L-4] **20**

Q.7   Explain working principle of 'ultra sonic welding' with a neat sketch along with its advantages, disadvantages and applications.   [CO-3, 4][L-3] **20**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
AUTOMATION (MII-604)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1   Answer in brief:
  a) Define 'Automation'. State its two disadvantages.   [CO-2][L-1]
  b) Explain fixed cost.   [CO-1][L-1]
  c) Define 'unit cost of production'.   [CO-2][L-2]
  d) What is an automated flow line?   [CO-2][L-1]
  e) Explain automated assembly.   [CO-1][L-2]
  f) Explain the function of part feeding devices.   [CO-2][L-1]
  g) Differentiate between inspection and testing.   [CO-1][L-2]
  h) State the various points at which inspection can be done.   [CO-2][L-1]
  i) Define 'CMM probe'.   [CO-1][L-2]
  j) Name various components of CMM machine.   **2x10**

PART-A

Q.2   Explain various automation strategies in detail.   [CO-2, 3][L-2] **20**

Q.3   Explain various methods of work-part transport in detail.   [CO-3,4][L-3] **20**

Q.4   Explain analysis of a single station assembly system in detail.   [CO-3,4][L-3] **20**

PART-B

Q.5   Discuss contact and non-contact inspection techniques in detail.   [CO-4,5][L-3] **20**

Q.6   Explain the working of a CMM machine. What are the different types of CMM machines
       and their applications?   [CO-3,6][L-4] **20**

Q.7   Explain automated guided vehicle, its types, components and technologies used in it.
                                                                    [CO-4,5][L-3] **20**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
VEHICLE BODY ENGINEERING (MII-605)

Time: 3 hrs.   Max Marks: **100**
                                                                            No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1 a) Define passive safety features in a car.   [CO-1][L-1]
     b) What is the effect of panoramic windshield?   [CO-1][L-1]
     c) What is cut-off and parting operation?   [CO-2][L-2]
     d) Define 'drag'.   [CO-1][L-1]
     e) What is a split level bus?   [CO-1][L-2]
     f) What is Yawing?   [CO-2][L-1]
     g) Define 'commercial vehicle'.   [CO-2][L-2]
     h) Define 'Integral type bus body.   [CO-1][L-1]
     i) Define 'Tractor'.   [CO-2][L-2]
     j) Write down various components of a tractor.   [CO-1][L-1] **2x10**

PART-A

Q.2 Explain drag and its types in detail, with neat sketches.   [CO-2][L-3] **20**

Q.3 Explain various Flow Visualization techniques.   [CO-3][L-4] **20**

Q.4 Explain the following:
     a) Mini bus.
     b) Town bus.
     c) Suburban bus.
     d) Long distance coaches.
     e) Touring coaches.   [CO-3][L-3] **4x5**

PART-B

Q.5 Differentiate between conventional and integral type frame manufacturing.
                                                                         [CO-2][L-5] **20**

Q.6 Explain construction of commercial vehicle body.   [CO-3][L-3] **20**

Q.7 Explain the following (in case of a tractor):
     a) Wheelbase.
     b) Ground clearance.
     c) Track.
     d) Cage wheel.

                                                                         [CO-4][L-3] **5x4**

End Semester Examination, May 2022
B. Tech. – Sixth Semester
DIE DESIGN (MII-606)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 3

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Each question carries equal marks.*

Q.1　a)　Which of these is made in thermosetting plastics?
　　　　　i)　Car bumper
　　　　　ii)　Electric switch
　　　　　iii)　Car Dash board　　　　　　　　　　　　　　　　　{CO-1} L2}
　　　b)　Which of the following is a part of injection moulding process?
　　　　　i)　Melting
　　　　　ii)　Mould heating
　　　　　iii)　Pattern making　　　　　　　　　　　　　　　　　{CO-2} L2}
　　　c)　Shot capacity of an Injection molding machine is the:
　　　　　i)　Maximum polystyrene that can be melted in 1 hour
　　　　　ii)　Maximum clamping force of a machine
　　　　　iii)　Maximum polystyrene that can be injected in one stroke　　{CO-1} L2}
　　　d)　The material of a core in Injection mold is:
　　　　　i)　HCHCr
　　　　　ii)　Mild steel
　　　　　iii)　Hot Die steel (H12)　　　　　　　　　　　　　　　{CO-3} L2}
　　　e)　Poor Mould cooling in injection moulding would result in:
　　　　　i)　Low wastage
　　　　　ii)　High cycle time
　　　　　iii)　Poor strength　　　　　　　　　　　　　　　　　{CO-2} L2}
　　　f)　What is the feature of hot runner mould?
　　　　　i)　Superior finish
　　　　　ii)　No material wastage
　　　　　iii)　Low cooling time　　　　　　　　　　　　　　　　{CO-3} L2}
　　　g)　What is the advantage of 3 plate mould?
　　　　　i)　Automatic separation of part and runners
　　　　　ii)　Higher accuracy
　　　　　iii)　Side hole　　　　　　　　　　　　　　　　　　　{CO-6} L3}
　　　h)　What is the distinctive feature of a cam mould?
　　　　　i)　Lower cycle times
　　　　　ii)　Side formation or hole in product
　　　　　iii)　Neither of the two　　　　　　　　　　　　　　　{CO-4} L2}
　　　i)　In a Compression mold:
　　　　　i)　Mold is heated
　　　　　ii)　Mold is cooled
　　　　　iii)　Neither of the two　　　　　　　　　　　　　　　{CO-5} L2}
　　　j)　Which of the following is a thermosetting plastic?
　　　　　i)　Bakelite
　　　　　ii)　Polythene
　　　　　iii)　Polycarbonate　　　　　　　　　　　　　　　　　{CO-6} L2}

End Semester Examination, May 2022

M.Sc. – Second Semester
GENETIC ENGINEERING AND APPLICATIONS (MS-BT-201)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1   Answer in brief:
   a) Compare Type-I, Type-II and Type-III restriction endoribonucleases.   [CO-2][L-2]
   b) For cloning your PCR product in a TOPO vector, the appropriate choice of polymerase for PCR is the Taq polymerase. Why?   [CO-3][L-3]
   c) For cloning into a TOPO vector, how would you treat your blunt ended insert which has 5' phosphate groups?   [CO- 5][L-3]
   d) List two utilities of the Taq DNA polymerase.   [CO-1][L-1]
   e) Give examples of methylation sensitive restriction endonucleases.   [CO-1][L-1]
   f) Mention a characteristic feature of the Class-II restriction endonucleases.
                                                                              [CO-1][L-1]
   g) List the most commonly used nucleases for genome editing.   [CO-4][L-1]
   h) Compare the two repair mechanisms involved in genome editing.   [CO-4][L-2]
   i) List at least three reasons for cloning a gene in mammalian cells.   [CO-5][L-2]
   j) You need to sequence your PCR product. Propose atleast two methods to get rid of the primers from your PCR product.   [CO-2][L-6] **2×10**

PART-A

Q.2   a) How is lacZ alpha complementation used for blue white selection during gene cloning?   [CO-5][L-3] **10**
   b) Design a methodology to clone and express a gene, "gene X", in E.coli cells.
                                                                         [CO-6][L-6] **10**

Q.3   a) Describe three of the most commonly used selectable markers during gene cloning.   [CO-6][L-3] **10**
   b) Illustrate the process of Polymerase Chain Reaction.   [CO-2][L-2] **10**

Q.4   a) Would you choose Klenow fragment for converting sticky ends of a piece of DNA to blunt ends? Give reasons.   [CO-5][L-3] **10**
   b) Describe two types of cloning vectors for E.coli cells.   [CO-1][L-2] **10**

PART-B

Q.5   a) You isolated a pathogen to purity. Construct an outline for sequencing its genome.
                                                                        [CO-6] [L-6] **10**
   b) You amplified a gene by PCR and cloned it into an expression vector. In order to confirm its DNA sequence, would you choose to sequence your clone by Sanger method or by an NGS method. Give reasons for your choice.   [CO-5] [L-5] **10**

Q.6   a) How does the nanopore sequencing work?   [CO-1] [L-2] **10**

End Semester Examination, May 2022

M. Sc. – Second Semester

BIOPROCESS TECHNOLOGY (MS-BT-202)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt* **FOUR** *questions from* **PART-A, B** *and* **C** *by attempting* **ONE** *question from each* **PART**. *Marks are indicated against each question.*

Q.1   Answer in brief:
  a) Define 'bioprocess technology'.
  b) List the raw materials used as nitrogen sources in fermentation.
  c) Define 'unit operations in downstream processing'.
  d) What are the biological methods of cell lysis?
  e) What are secondary metabolites?
  f) What is batch sterilization?
  g) Define 'contact inhibition'.
  h) What is perfusion fermentation?
  i) What are antifoam agents?
  j) How is culture preserved?   **2×10**

PART-A

Q.2   Classify various types of bioreactors and explain microbial growth kinetics in a Batchfermenter   [CO-2] [L-2] **20**

Q.3   What are the consequences of fermentation contamination? Explain the methods to avoid it.   [CO-3] [L-2] **20**

PART-B

Q.4   Insulin is a protein of high therapeutic value. Explain the industrial production of human insulin.   [CO-4] [L-2] **20**

Q.5   Define the components required in microbial medium formulation and give reasons for their requirement.   [CO-2] [L-2] **20**

PART-C

Q.6   Compare suspension and immobilized cells in culture. Explain the bioreactors which can be employed to culture immobilized cells.   [CO-5] [L-2] **20**

Q.7   You were given a task to purify recombinant protein X expressed in yeast. Apply your knowledge of the course and discuss methods employed in downstream processing.
                                                                                                       [CO-4] [L-3] **20**

End Semester Examination, May 2022
M. Sc. – Second Semester
BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (MS-BT-203)

Time: 3 hrs.

Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt **FOUR** questions from **PART-A, B** and **C** by attempting **ONE** question from each **PART**. Marks are indicated against each question.*

Q.1   Answer in brief:
  a) What do you mean by maximum parsimony?
  b) Distinguish between CDS and ORF.
  c) Enlist two Pairwise sequence alignment tool used to find homology.
  d) Explain role of promoter in gene prediction.
  e) Define paralogous and orthologus gene.
  f) What are the factors considered while comparing gene structure?
  g) Why structure of gene is so important?
  h) Explain Nucleotide sequence databases.
  i) Contrast global alignment with local alignment.
  j) Infer Bio-simulation using suitable example.   **2x10**

PART-A

Q.2   a) What are the approaches used to analyze biological sequences?   [CO-1] [L-1] **5**
       b) Explain the process of collecting and storing sequences in laboratory.
                                                                       [CO-1] [L-3] **15**

Q.3   a) Examine any sequencing method used to annotate sequence.   [CO-2] [L-1] **14**
       b) In bioinformatics sequences are written in particular format. Compare three sequence format using suitable example.   [CO-2] [L-2] **6**

PART-B

Q.4   Analyze the given sequence using dynamic programming for the given sequences GCTG and GTTC upto trace back using +2, -1 and 0 for match, mismatch and gap penalty respectively.   [CO-2[L-4] **20**

Q.5   Construct multiple sequence alignment using UPGMA method taking five species nucleotide sequence of 8 base pair for phylogenetic prediction.   [CO-4] [L-3] **20**

PART-C

Q.6   a) Apply computational steps involved in gene prediction.   [CO-5] [L-5] **10**
       b) Compile information one can extract from comparison of different genome.
                                                                       [CO-5] [L-5] **10**

Q.7   Explain the method which helps to annotate functional classification of gene.
                                                                       [CO-6] [L-6] **20**

End Semester Examination, May 2022
M.Sc. – Second Semester
IMMUNOLOGY (MS-BT-222)

Time: 3 hrs.   Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt* **FOUR** *questions from* **PART-A, B** *and* **C** *by attempting* **ONE** *question from each* **PART**. *Marks are indicated against each question.*

Q.1   Answer the following in brief:
a) Define the terms epitope and paratope.   [CO:1] [L-1]
b) Contrast between primary and secondary lymphoid organs.   [CO:2] [L-2]
c) Illustrate the process of opsonization.   [CO:3] [L-3]
d) Analyze the difference between polyclonal and monoclonal antibodies.
                                                               [CO:5] [L-4]
e) Evaluate the reasons for the occurrence of Primary immune deficiency disease and secondary immune deficiency disease.   [CO:4] [L-5]
f) Elaborate the technique by which one can detect whether the transplantation is accepted or rejected.   [CO:6] [L-6]
g) What is Hypersensitivity?   [CO:3] [L-1]
h) Explain about the immunity to parasitic infections.   [CO:5] [L-2]
i) Contrast between lectin and classic complement pathway.   [CO:4] [L-4]
j) Identify the difference between triggering of B cells by T-independent antigen and T-dependent triggering.   [CO:2] [L-3] **2×10**

PART-A

Q.2   a) Describe structure organization and function of Skin Associated Lymphoid Tissue. (SALT).   [CO:1] [L-1] **10**
b) What is major histocompatibility complex? Contrast between MHC I and MHCII.
                                                               [CO:1] [L-3] **10**

Q.3   Determine the structure and functions of different types of antibodies.   [CO:2] [L-5] **20**

PART-B

Q.4   a) Analyze the formation of antibody heavy chain and light chain Gene formation.
                                                               [CO:4] [L-4] **10**
b) Explain the antigen processing from endogenous and exogenous pathway.
                                                               [CO:3] [L-5] **10**
Q.5   Evaluate the difference between classic and alternate complement pathway. Also explain the MAC formation and its significance.   [CO:3] [L-5] **20**

PART-C

Q.6   a) Illustrate the way by which the immune system works against extracellular and intracellular bacterial infections.   [CO:5] [L-4] **10**
b) Discuss Type-I and Type-IV hypersensitivity mechanisms.   [CO:6] [L-4] **10**

Q.7   Explain transplantation and its types. Design an experiment to show the

End Semester Examination, May 2022
M.Sc. (Microbiology) – Second Semester
HUMAN GENOME (MS-BT-223)

Time: 3 hrs

Max Marks: **100**

No. of pages: 4

Note: *Attempt any* **FIVE** *questions in all;* **Q.1 is compulsory**. *Taking at least* **ONE question** *from each* **UNIT**. *All questions carry equal marks*

Q.1   Answer in brief:
   a) Mention two main goals of the Human Genome Project.   [CO1] [L2]
   b) What were the two types of approaches applied to analyze the human genome?
                                                                          [CO4] [L2]
   c) The size of the genome is unconnected to the complexity of the body organization. Comment.   [CO1] [L2]
   d) SNPs originated as mutations. Comment   [CO1] [L2]
   e) Why do the repetitive sequences pose a problemduring sequencing?   [CO1] [L4]
   f) What is a C-value Paradox?   [CO2] [L4]
   g) What is Gene Mapping?   [CO1] [L5]
   h) The Human Genome consist of two distinct parts, nuclear and non-nuclear. Comment.
                                                                          [CO2] [L6]
   i) What is the Chargaff Rule?   [CO1] [L2]
   j) Name the two non-coding RNAs that play crucial role during translation. [CO2] [L2]
                                                                          2x10

UNIT-I

Q.2   The data in the two figures (a) and (b) show the distribution of CNEs in the C. elegans genome. Please go through the data provided and answer the questions: [CO4] [L6]
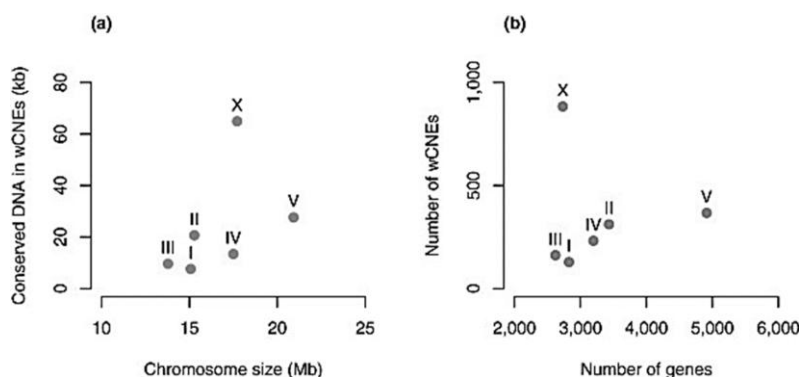
   a) Interpret the data shown in figure (a)   **5**
   b) Interpret the data shown in figure (b)   **5**
   c) Which chromosome show maximum number of CNEs?   **2**
   d) Is there any correlation between chromosome size and number of CNEs?   **3**
   e) Is there a correlation between the number of genes and their associated CNEs?   **3**
   f) Which chromosome shows maximum number of genes but still less number of CNEs associated with it?   **2**

Q.3   Write short notes on **(any four):**
   a) RFLPs
   b) SSLPs

End Semester Examination, May 2022
M.Sc. (Biotechnology) – Second Semester
BIOFERTILIZER AND BIOPESTICIDE (MS-BT-224)

Time: 3 hrs.   Max Marks: **100**
No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all;* **Q.1 is compulsory**. *Taking atleast* **ONE question** *from each* **UNIT**. *Marks are indicated against each question.*

Q.1   Answer in brief:
   a) How do nitrogen fixing bacteria create an environment with low oxygen concentration to keep their nitrogenase active?   (CO-1) (L-1)
   b) Differentiate between determinate and indeterminate nodules.   (CO-2) (L-1)
   c) What should be the desirable properties of a carrier material to be used for the production of biofertilizer culture packets?   (CO-6) (L-1)
   d) How tissue nutrient concentration in plants is related to plant performance?
                                                                          (CO-1) (L-3)
   e) In what form P, C, Mg and S are taken up by plants?   (CO-3) (L-2)
   f) Under what conditions denitrification is favoured?   (CO-4) (L-3)
   g) What would happen if we add a foodstuff with a higher C:N ratio to the soil such as wheat straw with a C:N of 80:1? Conversely, what would happen if a foodstuff with a lower C:N ratio, such as a hairy vetch cover crop with a C:N of 11:1 is added?   (CO-5) (L-1)
   h) What are siderophores? Why are they important?   (CO-1) (L-1)
                                                                          2½x8

UNIT-I

Q.2   a) Discuss the structure of nitrogenase.   (CO-1) (L-2) **7**
       b) How symbiotic nitrogen fixing bacteria undergo nodulation in leguminous plants? How the process is regulated?   (CO-2) (L-2) **13**

Q.3   a) What are the key signals that regulate nitrogen fixation in *K.pnemoniae* . Explain in detail.   (CO-1) (L-3) **12**
       b) Briefly enumerate the major structural and biochemical changes that occur during differentiation of a vegetative cell into a heterocyst.   (CO-2) (L-3) **8**

UNIT-II

Q.4   Ministry of Agriculture & Farmers' Welfare under Government of India is committed to boost the use of bio fertilizers instead of chemical fertilizers through State Governments under various schemes and programmes. Why are they encouraging the use of bio-fertilizers instead of chemical fertilizers? What are the different categories of organisms that government can consider as an alternative to chemical fertilizers?
                                                                          (CO-3) (L-3) **20**

Q.5   Give a detailed account of mass cultivation of phosphate solubilzing bacterial inoculants and its use as biofertilizer.   (CO-4) (L-3) **20**

UNIT-III

Q.6   Explain the following wrt to mode of action and production:
       a) Bacterial pesticides.
       b) Viral Pesticides.

End Semester Examination, May 2022
M.Sc. (Microbiology)–Second Semester
SYSTEMATIC BACTERIOLOGY (MS-MB-201)

Time: 3 hrs

Max Marks: **100**

No. of pages: 1

Note: *Attempt any* **FIVE** *questions in all;* **Q.1 is compulsory**. *Taking at least* **ONE question** *from each* **UNIT**. *Marks are indicated against each question.*

Q.1   Answer in brief:
  a) How thiobacillus can be enriched from a given sample?   (CO-1) (L-3)
  b) What is the difference between group-I and group-II sulfate reducers?(CO-2) (L-1)
  c) Why is lactobacillus found in the urogenital tract of normal adult women?
                                                                              (CO-6) (L-3)
  d) Although a Gram positive coccus, why is the organism Deinococcus distinct among Gram positive bacteria?   (CO-2) (L-3)
  e) Compare and contrast mycoplama with thermoplasma.   (CO-2) (L-3)
  f) Discuss the economic importance of bacillus thuringenesis.   (CO-5) (L-3)
  g) Why sucrose is considered to be highly cariogenic?   (CO-3) (L-3)
  h) Some strains of E.coli are pathogenic while others are not. Why?   (CO-4) (L-3)

2½x8

UNIT-I

Q.2   a) Explain the different routes of C1 incorporation that are used by methylotrophs. In what ways are these pathways different?   (CO-2) (L-3) **10**
  b) Compare and contrast sulfate reducing bacteria, nitrifying bacteria, sulfur oxidizing bacteria and hydrogen bacteria in terms of electron donors, electron acceptors, carbon source and ecology.   (CO-1) (L-3) **10**

Q.3   Discuss the life cycle, ecology and physiology of:
  a) Hyphomicrobium.
  b) Caulobacter.   (CO-2) (L-3) **10x2**

UNIT-II

Q.4   a) List down the general characteristics of Crenarchaeota.   (CO-3) (L-3) **10**
  b) List down the biochemical steps for the formation of butyric acid and butanol from sugars by Clostridia species.   (CO-4) (L-3) **10**

Q.5   a) Differentiate between 'homofermentative' and 'heterofermentative' lactic acid bacteria   (CO-3) (L-3) **12**
  b) Discuss the principle of acid alcohol fastness.   (CO-4) (L-3) **8**

UNIT-III

Q.6   For each of the exotoxins listed below describe i) the producing organism ii) the mode of action in the host:
  a) Diphtheria toxin.
  b) Tetanus toxin.
  c) Botulinum toxin.

End Semester Examination, May 2022
M. Sc. (Microbiology) – Second Semester
MOLECULAR IMMUNOLOGY AND IMMUNOGENETICS
(MS-MB-204)

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　Max Marks: **100**

No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt* **FOUR** *questions from* **PART-A, B** *and* **C** *by attempting* **ONE** *question from each* **PART**. *Marks are indicated against each question.*

Q.1　Answer the following in brief:
　　a) Define the terms: 'Immunogenicity and antigenicity'.　　　　　[CO:1] [L-1]
　　b) Contrast between primary and secondary immune response.　　[CO:2] [L-2]
　　c) Illustrate the process of opsonization.　　　　　　　　　　　[CO:1] [L-3]
　　d) What is the significance of MAC formation?　　　　　　　　[CO:3] [L-4]
　　e) Outline the mechanisms by which antibody diversity generated.　[CO:2 [L-5]
　　f) Elaborate ELISA technique by which one can detect the presence of antibody in the Serum.　　　　　　　　　　　　　　　　　　　　　　　　　[CO:6] [L-6]
　　g) Discuss the principle of radial immune assay.　　　　　　　[CO:4] [L-2]
　　h) Explain the role of cytokine in cancer immunity.　　　　　　[CO:5] [L-2]
　　i) Contrast between direct and indirect immunofluorescence.　　[CO:6] [L-4]
　　j) Comments on Bombay blood groups.　　　　　　　[CO:3] [L-1] **2×10**

PART-A

Q.2　a) Describe structure organization and function of Mucosa-Associated Lymphoid Tissue (MALT).　　　　　　　　　　　　　　　　　　　[CO:1] [L-1] **10**
　　b) Determine the effect of pepsin and papain treatment on antibody structure. Also mention antibody types and functions.　　　　　　　　[CO:1] [L-3] **10**

Q.3　Contrast Alternate and Lectin complement pathway. Explain the formation and significance of membrane attack complex.　　　　　　　[CO:2] [L-5] **20**

PART-B

Q.4　a) Define major histocompatibility complex? Contrast between MHC I and MHCII with respect to its structure and functions.　　　　　　　[CO:1] [L-3] **10**
　　b) Outline the role of TAAs and TSAs in cancer.　　　　　[CO:2] [L-4] **10**

Q.5　What do you understand by cancer immunotherapy? Explain different methods for cancer immunotherapy.　　　　　　　　　　　　　　[CO:4] [L-5] **20**

PART-C

Q.6　a) Describe the various blood products and uses of each. Also explain Landsteiner's blood Group System.　　　　　　　　　　　　　[CO:5] [L-4] **10**
　　b) Illustrate the mechanism for the generation of tumor specific antigens and tumor associated antigens.　　　　　　　　　　　　[CO:4] [L-3] **10**

Q.7　Discuss the principle of ELISA. Contrast between Direct and Indirect ELISA. Design an experiment for the detection of antibody in the serum by ELISA.　[CO:6] [L-6] **20**

End Semester Examination, May 2022

M. Sc. (Microbiology) – Second Semester
VIROLOGY, MYCOLOGY AND PARASITOLOGY (MS-MB-224)

Time: 3 hrs.
Max Marks: **100**

No. of pages: 1

Note: *Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt **FOUR** questions from* **PART-A, B** *and* **C** *by attempting **ONE** question from each **PART**. Marks are indicated against each question.*

Q.1 Answer in brief:
   a) How are viroids different from viruses? [CO-1][L-3]
   b) What are satellite viruses? [CO-1][L-1]
   c) Differentiate between chronic and latent viral infections. [CO-2][L-2]
   d) How is the taxonomical classification of bacteriophages correlated with phage physiology and life style? [CO-1][L-2]
   e) Which class of fungus you most likely find in the following environments: tree roots, mud and two-week-old cake? [CO-4][L-4]
   f) Differentiate between a mold and a yeast. [CO-4][L-2]
   g) Infer the meaning of a "dikaryotic fungus". [CO-3][L-3]
   h) What organelles are present in the cytoplasm of a typical fungi? [CO-3][L-1]
   i) How does Leishmania avoid its destruction by the host immune system?[CO-6][L-3]
   j) Describe the two membrane-bound organelles of endosymbiotic origin that are found in the species of Plasmodium. [CO-5][L-2] **2×10**

PART-A

Q.2 a) Illustrate and describe the various morphological structures of virus particles.
   [CO-1][L-2] **10**
   b) List the common characteristics of viruses and describe how are viruses classified under the Baltimore system of classification? [CO-1][L-2] **10**

Q.3 a) Explain the types of transduction and how they are associated with life cycles of bacteriophages? [CO-1][L-3] **10**
   b) Summarize the various modes of viral transmission with examples. [CO-2][L-2] **10**

PART-B

Q.4 a) What does persistent viral infection mean? [CO-2][L-2] **10**
   b) Compare the following types of asexual fungal spores: blastospore, sporangiospore, conidiospore and arthrospore. [CO-3][L-1] **10**

Q.5 a) Describe ecological, medical and economic importance of ascomycetes.
   [CO-4][L-2] **10**
   b) Evaluate the role of fungal decomposition on global carbon flux. [CO-4][L-5] **10**

PART-C

Q.6 a) How are zygomycetes beneficial to humans? [CO-4][L-3] **10**
   b) Illustrate the life cycle of a Rhizopus species. [CO-3][L-1] **10**

Q.7 a) What is the mechanism(s) by which Entamoeba. histolytica induces tissue damage? [CO-6][L-2] **10**

End Semester Examination, May. 2022
M. Sc. – Second Semester
VIROLOGY, MYCOLOGY & PARASITOLOGY (MS-MB-224)

Time: 3 hrs.   Max Marks: **100**
No. of pages: 1

Note: *Attempt* **FIVE** *questions in all;* **Q.1 is compulsory**. *Attempt any* **TWO** *questions from* **PART-A** *and* **TWO** *questions from* **PART-B**. *Marks are indicated against each question.*

Q.1 Answer the following questions:
   a) How are viroids different from viruses?   [CO-1][L-3]
   b) What are satellite viruses?   [CO-1][L-1]
   c) Differentiate between chronic and latent viral infections.   [CO-2][L-2]
   d) How is the taxonomical classification of bacteriophages correlated with phage
      physiology and life style?   [CO-1][L-2]
   e) Which class of fungus you most likely find in the following environments: tree
      roots, mud and two-week-old cake?   [CO-4][L-4]
   f) Differentiate between a mold and a yeast.   [CO-4][L-2]
   g) Infer the meaning of a "dikaryotic fungus".   [CO-3][L-3]
   h) What organelles are present in the cytoplasm of a typical fungi?   [CO-3][L-1]
   i) How does Leishmania avoid its destruction by the host immune system?[CO-6][L-3]
   j) Describe the two membrane-bound organelles of endosymbiotic origin that are
      found in the species of Plasmodium.   [CO-5][L-2] **2×10**

PART-A

Q.2 a) Illustrate and describe the various morphological structures of virus particles.
                                                                   [CO-1][L-2]
     b) List the common characteristics of viruses and describe how are viruses classified
        under the Baltimore system of classification?   [CO-1][L-2] **10×2**

Q.3 a) Explain the types of transduction and how they are associated with life cycles of
        bacteriophages?   [CO-1][L-3]

     b) Summarize the various modes of viral transmission with examples.[CO-2][L-2] **10×**

Q.4 a) What does persistent viral infection mean?   [CO-2][L-2]

     b) Compare the following types of asexual fungal spores: blastospore,
        sporangiospore, conidiospore and arthrospore.   [CO-3][L-1] **10×2**

PART-B

Q.5 a) Describe ecological, medical and economic importance of ascomycetes.
                                                                   [CO-4][L-2]

     b) Evaluate the role of fungal decomposition on global carbon flux. [CO-4][L-5] **10×2**

Q.6 a) How are zygomycetes beneficial to humans?   [CO-4][L-3]