Registration no.: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech**
REL5D005

5th/ 7th Semester Regular/Back Examination: 2024-25
RENEWABLE POWER GENERATION SYSTEMS
Branch: CST, CSEAI, CSE, CSEAIME, EEE, ELECTRICAL
Time: 3 Hours
Max Marks: 100
Q.Code: R237

Answer all questions of Part-A, any 08 questions of (Part-B) and any two from Part-C.
The figures in the right-hand margin indicate marks.

Part- I

Q1 **Objective Answer Type Questions (Answer All):** **(02x10)**

a) Give two examples of non-renewable small-scale distributed generation sources.
b) Name two MPPT methods with brief explanation.
c) A solar cell is basically a current source, controlled by flux of radiation: True or False. Comment with justification.
d) What is the basic difference between an active and passive Solar Heating systems?
e) What is Betz limit and how does it affect the design of wind turbines?
f) Describe an expression for energy available in the wind.
g) Comment on the range of wind speed which is considered to be favorable for wind power generation.
h) In modern wind electricity generating system, the blades are usually made of using which material?
i) State the advantages of a Diesel-PV system.
j) What is Pyrolysis? Briefly explain.

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any Eight)** **(06x08)**

a) Explain, what is maximum power point tracking (MPPT) in PV system?
b) Explain the working of a solar cooker.
c) Explain about Solar Cell, Solar PV Module, Solar PV Panel, and Solar PV Array.
d) Write a short note on Solar desalination systems.
e) Give the layout and working of wind electricity generation power plant.
f) Define Tip Speed Ratio (TSR) and derive an expression for it.
g) What do you mean by pitch angle? How pitch angle can be controlled in wind energy conversion system.
h) Derive the expression to obtain maximum torque on wind Turbine rotor.
i) Why reactive power compensation is required in wind firms and how is it provided? Explain.
j) What is Anaerobic digestion? Explain.
k) Explain the challenges in generating power from biomass.
l) Write a short note on Wind-PV system.

Part-III

Long Answer Type Questions (Answer Any Two)

Q3	Explain constructional details and the working principle of a flat plate solar collector? Explain its merits and demerits. Explain the effect of partial or complete shadowing on a solar cell in a PV module.	**(6+6+4)**
Q4 a)	Differentiate between Horizontal Axis Wind Turbine (HAWT) and Vertical Axis Wind Turbine (VAWT).	**(8)**
b)	Explain the construction and working principle of doubly-fed-induction-generator (DFIG). Discuss its merits and demerits	**(8)**
Q5	What is biomass energy? State the advantages and disadvantages of Biomass energy. Explain the process of commercial production of ethanol from biomass.	**(2+8+6)**
Q6	What are the merits of hybrid renewable power systems? Explain various types of electric and hybrid electric vehicles. Write a short note on Microhydel-PV and Biomass-Diesel systems.	**(4x4)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**

Sub_Code: REV5D004

5th / 7th Semester Regular/Back Examination: 2024-25

SUBJECT: DISASTER MANAGEMENT

BRANCH(S): AERO, AE, AME, AEIE, BIOTECH, C&EE, CIVIL, CSEAI, CSE, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ELECTRONICS & C.E, ETC, ENV, MECH, METTA, MINING

Time: 3 Hours

Max Marks: 100

Q.Code: R284

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What are the key factors for assessment of damage during natural calamities?
b) What do mean by response time?
c) Name two natural disasters.
d) What do you mean by a vulnerability atlas?
e) Name four methods for management of refuse during natural disaster.
f) What do you mean by capacity building?
g) Differentiate between thunder storm and cyclone.
h) Name two strategies undertaken for water supply during emergency.
i) What is disaster mapping?
j) Name any two rehabilitation measures undertaken during a disaster.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Discuss in brief about the levels of disaster.
b) Give a case study of earthquake type of natural disaster in India.
c) Describe the response time, frequency, and forewarning levels of different hazards.
d) Briefly discuss the preparation of state and district disaster management plans.
e) Explain how we plan for relief in case a disaster occurs.
f) Briefly discuss about post disaster recovery and rehabilitation.
g) Explain the role of mass media in disaster management.
h) Write a short note on national crisis management committee.
i) Prevention is better than cure. Explain in the contest of disaster management.
j) What do you understand by pre-disaster risk and vulnerability reduction? Explain the methods for achieving this.
k) Elaborate about disaster related infrastructure development.
l) Discuss about the structural measures of capacity assessment.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Discuss in detail about inclement climatic conditions like thunder storm, cyclone, tsunami and flooding.	**(16)**
Q4	Write the management issue related to natural disaster. How this can be mitigated through capacity building?	**(16)**
Q5	Elaborate about the engineering, architectural, landscaping and planning solution for different types of calamities.	**(16)**
Q6	Discuss about the Counter-Disaster Resources and their utility in Disaster Management.	**(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**
Sub_Code: RME5D001

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Automobile Engineering
BRANCH(S): MECH, MMEAM
Time: 3 Hours
Max Marks: 100
Q.Code: R296

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What are the important sub systems in an automobile?
b) What forces act on a car in motion?
c) Differentiate between chassis and body of an automobile.
d) How hydraulic brakes work?
e) What is overdrive and how is it achieved?
f) Differentiate between semi and fully automatic transmission.
g) What is the principle of correct steering?
h) Which steering mechanism is generally used in passenger cars?
i) How does the electrical charging system work?
j) Why are batteries used in car,how it is charged?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Show with a neat diagram the main parts of the braking system.
b) Write about some important points on motor vehicle act.
c) Differentiate between working of drum and disc brakes.
d) Explain the Hotchkiss drives.
e) Differentiate between a two wheel and a four-wheel drive neat diagram.
f) Explain working of torque converter.
g) Explain working of differential with a neat sketch.
h) Draw front wheel geometry of the steering system and explain Camber, castor, and kingpin inclination.
i) Explain different battery types used in EV.
j) Differentiate between series and parallel hybrid vehicles.
k) Explain working of fuel cells vehicles.
l) Write about important electronic and electrical components used in EV.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Explain with a neat sketch the working of the electrical system of an electric vehicle (EV).	**(16)**
Q4	Draw the Layout of an all-wheel drive transmission system and explain the main function of the different components of the transmission system.	**(16)**
Q5	Explain with a neat diagram steering condition for true rolling and explain Ackerman steering geometry working, also find out minimum steering radius.	**(16)**
Q6	Compare, with neat diagrams working and selection consideration of suspension system of a car.	**(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD(B.Tech and M.Tech)**
Sub_Code: RME5C001

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Basic Manufacturing Processes
BRANCH(S): MMEAM, MECH, ME
Time: 3 Hours
Max Marks: 100
Q.Code: R224

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Sketch the cross-section of a sand mould that is ready for pouring and label the various important parts.
b) Discuss the consequences of pouring molten metal into the mould cavity at a rapid and slower rate.
c) Explain the function of chills and chaplets in casting.
d) What are the types of flames in oxy-acetylene welding? Which flame is extensively used and why?
e) What are the advantages of AC equipment over DC equipment in arc welding?
f) Distinguish the compaction and sintering process in connection with the powder metallurgy.
g) What is the “angle of byte” in rolling? On what factors does it depend?
h) What are the advantages of hot working over cold working of metals?
i) What is hydrostatic extrusion? List out its specific applications.
j) What is the basic principle of wire drawing? Name the factors affecting the wire drawing process.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain different types of pattern allowances and their purposes with suitable examples.
b) Discuss the composition of molding sand and the role of binders and additives in the molding process.
c) With a neat sketch, describe the operation of a cupola furnace.
d) Describe the TIG welding process and list its advantages over MIG welding.
e) Distinguish between brazing and soldering from the point of view of the filler metals used, applications, and the strength of the joint obtained.

f) Write a short note on laser-beam welding detailing the applications. Explain various types of lasers used in the laser-beam welding process.

g) Explain the basic principles of Powder Metallurgy. Discuss the steps involved in the process and its advantages and limitations.

h) Explain the working principle of ultrasonic welding and its industrial applications.

i) Discuss the concept of plastic deformation in metals. How do variables such as strain rate, temperature, and stress affect metal-forming processes?

j) Describe the process of deep drawing giving examples of products manufactured by this process.

k) With neat sketches differentiate between direct and indirect extrusion?

l) Provide a brief overview of explosive forming, coating, and deposition methods. How are these methods used in modern manufacturing?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are the properties of molding sand? Explain how these properties are tested. Calculate the solidification time ratio for two steel cylindrical risers with dimensions 400 mm diameter by 800 mm height and 200 mm diameter by 400 mm height under identical cooling conditions. **(16)**

Q4 Discuss the common welding defects, their causes, and methods to prevent them. How can destructive and non-destructive testing be used to ensure weld quality? **(16)**

Q5 Describe the rolling and forging processes in detail. For rolling, explain the pressure and forces involved, the types of rolling mills, and common rolling defects. For forging, discuss Smith forging, drop forging, press forging, and machine forging, along with their respective advantages, disadvantages, and common forging defects. **(16)**

Q6 Write notes on: **(16)**

(a) Casting defects
(b) Resistance welding
(c) Electron Beam welding
(d) Forward and backward extrusion

Registration No.: | | | | | | | | | | |

Total Number of Pages: 03 **Course: B. Tech, IDD (B.Tech and M.Tech)**
Sub_Code: REL5C002

5th Semester Regular/Back Examination: 2024-25
SUBJECT: CONTROL SYSTEM
BRANCH(S): AEIE, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ETC, EE
Time: 3 Hours
Max Marks: 100
Q.Code: R022

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What modifications are essential for an induction motor to be used for servo applications?

b) Why should derivative controllers not be used as standalone controllers in control systems? Discuss the inherent limitations and potential drawbacks that arise from relying solely on a derivative controller.

c) What is the effect of the addition of zero on transient response of the system?

d) Calculate the value of α for a lag compensator such that the compensated system will have a static error constant of 20 sec^{-1}. Use the open loop transfer function of the uncompensated system as $G(s)=\frac{16}{s(s+4)}$ and the general form of the lag compensator as $G_c(s)=K_c\alpha\frac{1+Ts}{1+\alpha Ts}$.

e) State under what condition all elements in one row of Routh array become zero. Also state, in such case how Routh array can be completed.

f) Explain when a function is said to be analytic. Also define singular points.

g) Determine the phase margin of the control system having open loop TF $G(s)H(s)=\frac{20}{(s^2+6s+8)}$. Given the gain crossover frequency of the system is 3 rad / sec.

h) Determine the breakaway points of the root locus for the following open loop TF.

$$G(s)H(s)=\frac{1}{s(s+2)(s^2+2s+10)}$$

i) List any four properties of state transition matrix.

j) Check whether the characteristic equation $1.5z^2+0.5z-0.1=0$ of the discrete time system is stable or not.

Part-II

Q2 **Only Focused-Short Answer Type Questions - (Answer Any Eight out of Twelve)** **(6 x 8)**

a) The open loop TF of a unity feedback control system is

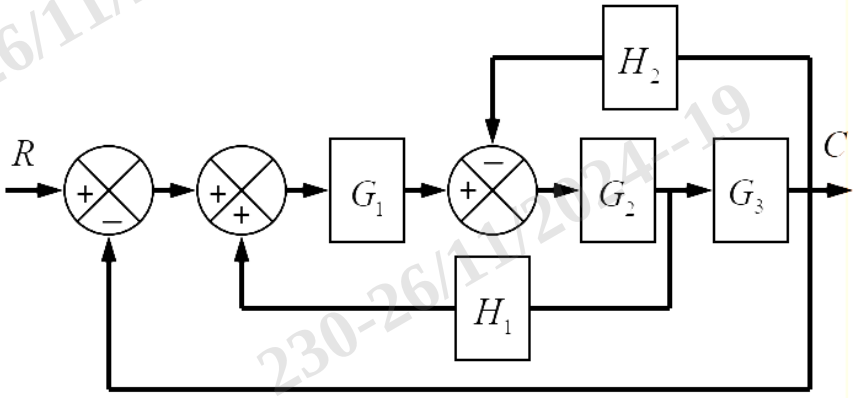
$$G(s)=\frac{K(s+5)(s+40)}{s^3(s+200)(s+1000)}$$

Discuss the stability of the closed loop system as a function of K by constructing Routh's array. Also, determine the value of K for which the closed loop system exhibits sustained oscillation and the frequency of oscillation.

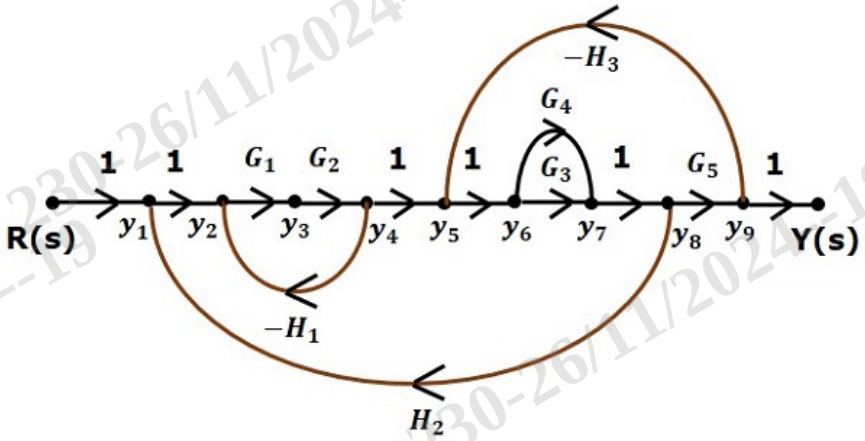
b) Derive the transfer function model of an armature-controlled DC servomotor.

c) For the open loop TF $G(s)H(s)=\frac{K(s+10)}{s(s+5)(s+25)(s+50)}$ sketch the root locus. Determine the complex conjugate roots for which the system will have damping ratio of 0.707.

d) Determine the overall transfer function of the following block diagram using block diagram reduction techniques.



e) Obtain the overall transfer function C / R of the following signal flow graph by using Mason's gain formula.



f) Applying Nyquist stability criterion, comment on the stability of the following unity feedback system for K = 2. $G(s)=K\frac{(1-s)}{(s+2)(s+3)}$

g) For a second order prototype system, discuss the effect of adding a P controller on transient response of the closed loop system by deriving relevant equations.

h) Sketch a Nyquist plot for a system with open loop TF $\frac{K(1+0.5s)(s+1)}{(1+10s)(s-1)}$.

i) Discuss the use of synchros as error detector for control system applications.

j) Compute the eigen values and the corresponding eigen vectors for the following system matrix.

$$A=\begin{bmatrix} 3 & 2 & -1 \\ 2 & 4 & 5 \\ -1 & 2 & 3 \end{bmatrix}$$

k) Given the open loop TF, $\frac{10}{s^3+3s^2+2s}$ design a state feedback controller so that the eigen values of the closed loop system are at $-2, -1 \pm j1$.

l) Design a suitable compensator using root locus technique for the unity feedback system having open loop transfer $\frac{K}{s(s+3)(s+6)}$ so that the dominant closed loop poles of the compensated system will have damping ratio of 0.5 and magnitude of the real part of the pole be less than unity. Further the static error constant should be at least 10 sec^{-1}.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 The open loop transfer function of a unity feedback system is given by $G(s)=\frac{K}{s(0.02s+1)(0.04s+1)}$. Draw the bode plot. Find the gain margin and phase margin. Hence find the value of the open loop gain so that the system has phase margin of 45° **(16)**

Q4 Derive the expression for the time response of a standard second order under damped system to a unit step input. Draw the time response plot and show the important time domain specifications. **(16)**

Further, determine the dominant closed loop pole locations of a servo system if the error response of the system is represented as $e(t)=1.4e^{-4t}\sin(2.86t+43^\circ)$.

Q5 Discuss in detail the methods used for tuning a PID controller, addressing both scenarios: when the plant dynamics are known and when they are unknown. **(16)**

Q6 For the following TF obtain the state space representation in controllable canonical form by drawing the necessary signal flow graph. **(16)**

$$TF=\frac{10(s+4)}{s(s+1)(s+3)}$$

For the system matrix obtained above, also compute the state transition matrix.

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech, IDD (B.Tech and M.Tech)**
Sub_Code: RCI5C001

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Design of Concrete Structures
BRANCH(S): C&EE, CIVIL
Time: 3 Hours
Max Marks: 100
Q.Code: R227

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.
(Use of relevant IS Codes is allowed)

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Calculate the tensile strength and modulus of elasticity of M20 grade concrete.
b) Where doubly reinforced beams are preferred?
c) For a beam of 300 mm wide and 600 mm effective depth, calculate the minimum area of tension steel required. Use Fe 415 steel.
d) What is the role of bent up bars in beams?
e) Determine the equivalent nominal shear for a beam of 250 mm wide and 500 mm effective depth, subjected to an ultimate twisting moment of 120 kNm and ultimate shear force of 80 kN.
f) Why the provision of minimum stirrup reinforcement is mandatory in all reinforced concrete beams?
g) Why steel is used in column?
h) Determine the effective flange width of an L-beam having an effective span of 6 m, rib width of 300 mm and flange thickness 100 mm.
i) Where retaining wall is provided?
j) State different types of water tank.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain limit state of collapse and serviceability requirements of structures.
b) Draw the stress-strain curves for reinforcing steels showing the special features.
c) State the behavior of beams with and without shear reinforcements with neat sketch.
d) A rectangular beam section of 300 mm width and 500 mm effective depth is reinforced with 4 bars of 20 mm diameter. Determine the shear reinforcement required to resist 50 kN shear force.

e) A double reinforced beam of size 250 mm x 400 mm overall is provided with tensile reinforcement of 4 bars of 12 mm dia and compressive reinforcement of 3 bars of 12 mm dia. The distance from extreme end upto centre of steel is 40 mm both at top and bottom. Calculate the ultimate moment of resistance of the beam. Use M20 concrete and Fe 415 steel.

f) What is combined footing? What are the situations in which combined footings are preferred to isolated footing?

g) A simply supported beam of clear span 5 m has to carry a superimposed load of 45 kN/m at service. The beam has a bearing of 400 m at each end. Find the reinforcement required. Use M20 and Fe415 steel.

h) Design a circular column to carry a service load of 1600 kN. Use M20 concrete and Fe415 steel.

i) Briefly explain the stability criteria of a retaining wall.

j) What is the purpose of a retaining wall? What are the different types of concrete retaining wall?

k) An open square tank 4.5 m x 4.5 m x 2.5 m deep is supported on brick masonry walls all around. Design the tank. Use M20 concrete and Fe250 steel.

l) Briefly explain the design requirements of elevated type water tanks.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Design a rectangular beam of section 300 mm x 600 mm subjected to an ultimate moment of 160 kNm, ultimate shear force of 60 kN and factored torsional moment of 35 kNm. Use M20 concrete and Fe415 steel. **(16)**

Q4 Design a simply supported RCC floor slab for a room having inside dimensions 4 m x 10 m and supported on all sides by a 400 mm thick wall. The superimposed load may be taken as 3 kN/m^2. Use M20 concrete and Fe415 steel. Assume any other data required suitably as per standard. **(16)**

Q5 Design an isolated column footing for a rectangular column, 400 mm x 600 mm carrying a service load of 1500 kN. Assume the safe bearing capacity of soil as150 kN/m^2. Show the reinforcement detailing. Use M20 concrete and Fe415 steel. **(16)**

Q6 Design a cantilever retaining wall to retain earth embankment 3 m high above ground level. The unit weight of earth is 18 kN/m^2 and its angle of repose is 30^0. The embankment is horizontal at its top. The SBC of soil is 100 kN/m^2 and the coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe 415 steel. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: REL5C003

5th Semester Regular/Back Examination: 2024-25
SUBJECT: ELECTRICAL MACHINE-II
BRANCH(S): ELECTRICAL, EEE, EE
Time: 3 Hours
Max Marks: 100
Q.Code: R069

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) How does a 3-phase alternator differ from a d.c. generator?
b) What are the advantages of short-pitched windings in an alternator?
c) What is the function of damper winding?
d) Why a single-phase induction motor noisier than 3-phase induction motor?
e) Why is the starting torque of a resistance split-phase motor not high?
f) What is the function of centrifugal starting switch in a single-phase induction motor?
g) What do you mean by synchronous speed of a 3-phase induction motor?
h) Why is the air gap between the rotor and stator of a 3-phase induction motor kept as small as possible?
i) Why does the rotor of the 3-phase induction motor rotate in the same direction as the rotating field?
j) What is the difference between squirrel cage rotor and wound rotor?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) A 500 h.p., 3-phase, 440 V, 50 Hz induction motor has a speed of 950 r.p.m. on full-load. The machine has 6 poles. Calculate the full-load slip. How many cycles will the rotor voltage make per minute?
b) Explain different methods of starting of three-phase induction motor.
c) Draw and explain the equivalent circuit and phasor diagram of three-phase induction motor.
d) A 440 V, 3-phase, 50 Hz, 4-pole, Y-connected induction motor has a full-load speed of 1425 r.p.m.. The rotor has an impedance of (0.4 + j4) Ohm per phase and rotor/stator turn ratio is 0.8. Calculate (i) full-load torque (ii) rotor current (iii) full-load rotor Cu loss.
e) Explain the operation of double squirrel cage motor with suitable diagram and equivalent circuit.
f) Using double field revolving theory, explain why a single-phase induction motor is not self starting.
g) Draw the equivalent circuit of single-phase induction motor and derive the impedance of forward parallel branch and the impedance of backward parallel branch.

h) Calculate the value of the distribution factor for a 3-phase winding of a 4-pole alternator having 36 slots.

i) The stator of a 3-phase alternator has 9 slots per pole and carries a balanced 3-phase, double layer winding. The coils are short-pitched and the coil pitch is 7 slots. Find the distribution factor and pitch factor.

j) A 3-phase, 16-pole synchronous generator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, sinusoidally distributed and the speed is 375 r.p.m. Calculate (i) the frequency and (ii) line induced e.m.f.

k) Explain the V curves for synchronous motor with suitable wave forms.

l) Discuss the principle of operation of induction generator with suitable diagram.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Derive the expression of power developed in salient – pole synchronous generator and draw the power angle characteristics. **(8)**

b) A 3-phase alternator has a direct-axis synchronous reactance of 0.85 p.u. and quadrature-axis synchronous reactance of 0.55 p.u.. Draw the phasor diagram for the alternator when operating on full load at 0.8 p.f. lagging and determine (i) load angle (ii) the no-load p.u. voltage (iii) per unit voltage regulation. Neglect armature resistance. **(8)**

Q4 **a)** Explain parallel operation of alternators with suitable diagram. What are the advantages of parallel operation of alternators and what are the conditions for paralleling alternator with infinite bus bars? **(8)**

b) A 3000 KVA, 6-pole alternator runs at 1000 r.p.m. in parallel with other machines on 3300 V busbars. The synchronous reactance is 25%. Calculate the synchronizing power for one mechanical degree of displacement and the corresponding synchronizing torque. **(8)**

Q5 Discuss two reaction theory of salient pole synchronous machine and hence explain its phasor diagram. Compare it with cylindrical rotor synchronous machine. **(16)**

Q6 **a)** Explain the armature reaction of synchronous generator with various cases. **(8)**

b) A 500 KVA, 3-phase, Y-connected alternator has a rated line-to-line voltage of 3300 V. The resistance and synchronous reactance per phase are 0.3 Ω and 4 Ω respectively. Calculate the line value of the e.m.f. generated at full load, 0.8 p.f. lagging. **(8)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**

Sub_Code: RME5D006

5th Semester Regular/Back Examination: 2024-25

SUBJECT: Finite Element Methods in Engineering

BRANCH(S): MECH

Time: 3 Hour

Max Marks: 100

Q.Code: R026

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is plain stress and plain strain conditions?

b) Define shape function and write down its property.

c) What is discretization?

d) Explain the basic principle of Rayleigh-Ritz method.

e) Name two FEA softwares.

f) Differentiate between global and local axes.

g) Where finite element method is used?

h) What is the importance of Pascal's triangle in FE analysis?

i) What is a CST element?

j) Find out natural frequency of a fixed free bar with one element discretization.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) List and describe the general steps in finite element method.

b) Derive the shape functions and strain displacement matrix for a 2-noded 1-D bar element.

c) Describe about Gelerkin's approach used in finite element method.

d) For a two noded bar element, determine the shape functions using natural coordinate system.

e) What is lumped load procedure explain with suitable example.

f) Explain Rayleigh-Ritz method and its application in FEA.

g) Briefly describe the co-ordinates classifications in FEM.

h) List advantages, disadvantages, and applications of FEM.

i) Explain the difference between linear element and quadratic element.

j) Distinguish between CST and LST elements.

k) What are the non-zero strain and stress components of axisymmetric elements? Explain.

l) Briefly explain the steps preprocessing and post processing in commercially FEA packages.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** A 1-D bar element is shown in Fig. 1. Calculate the followings: (x_1 = 10 mm and x_2 = 30 mm). **(8 x 2)**

(i) Shape function N_1 and N_2 at point B.

(ii) If u_1 = 2 mm and u_2 = –4 mm, calculate the displacement u at point B.

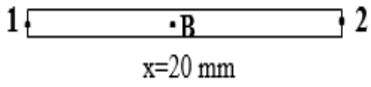


Fig. 1

b) The following differential equation is available for a physical phenomenon $AE\frac{d^2y}{dx^2} + p = 0$ with the boundary conditions.

$$y(0) = 0$$

$$\left.\frac{dy}{dx}\right|_{x=L} = 0$$

Find the value of $f(x)$ using the weighted residual method.

Q4 Consider the spring system shown in the Fig. 2 and Determine: **(16)**

a) the global stiffness matrix for the system,

b) the displacement at node 2 and 3.

c) the reaction at node 1.

d) the force in each spring. Take k_1 = 50 kN/m, k_2 = 100 kN/m and P = 10 kN.

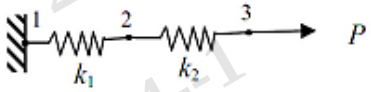


Fig. 2

Q5 Determine the shape functions for a Constant Strain Triangles (CST) element in terms of natural co-ordinates system. **(16)**

Q6 From fundamental principle derive the stiffness matrix and the load vector for fluid mechanics in two dimensional finite element analysis. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: RCI5C003

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Geotechnical Engineering
BRANCH(S): C&EE, CIVIL, CE,
Time: 3 Hours
Max Marks: 100
Q.Code: R070
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Distinguish between Residual and Transported soil.
b) Differentiate between Compaction and Consolidation.
c) Establish the relationship between void ratio and porosity of soil mass.
d) What are the assumptions made by Boussinesq's in deriving the expression for stress in soil due to a point load on the ground surface?
e) State the different modes of soil water.
f) Define Consistency Limits. Why they are required to find in geotechnical Engineering?
g) Draw the Mohr's circle for unconsolidated undrained test and explain about failure envelop.
h) Write the equation of the A-line, and explain the terms in it.
i) Draw a typical grain size distribution curves for different types of soils.
j) What is the use of New mark's influence chart?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) The mass of wet soil when compacted in a mould was 19.6 kN. The water content of the soil was 15%. If the volume of the mould was 0.96 m^3, Determine (i) dry unit weight, (ii) Void ratio, (iii) degree of saturation and (iv) percent air voids. Take G = 2.7.
b) Differentiate between Standard Proctor Test and Modified Proctor Test.
c) For a gravel with D_{60} = 4.8 mm, D_{30} = 1.25 mm and D_{10} = 0.35 mm, calculate the uniformity coefficient and coefficient of curvature. Is it a well graded or a poorly graded soil?
d) The laboratory tests on a sample of soil gave the following results:
w_n = 24 %, w_L = 62 %, w_p = 28 %, percentage of particles less than 2 microns = 23%.
Determine: (i) The liquidity index, (ii) activity, (iii) consistency and nature of soil.

e) Differentiate between shear strength parameters obtained from total and effective stress considerations.

f) What is relation between OMC and MOD? Draw the graph for zero air voids.

g) Define Quick sand condition and derive the expression for critical hydraulic gradient.

h) Discuss the drainage conditions generally used in tri-axial compression test.

i) State and explain Darcy's law.

j) What do you understand by 'Pressure bulb'? Illustrate with sketches.

k) Discuss Terzaghi's theory of consolidation by stating the various assumptions and its validity.

l) State under consolidated, normally consolidated, and over consolidated soil with example.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Describe the formation of soil due to mechanical weathering. **(8)**

b) A soil stratum consists of 3 layers of thickness 1 m, 1.5 m and 2.0 m having the coefficient of permeability of 2 x 10^{-3} cm/s, 1.5 x 10^{-3} cm/s and 3 x 10^{-3} cm/s respectively. Estimate the average co-efficient of permeability in the direction i) parallel to the bedding plane ii) normal to the bedding plane. **(8)**

Q4 **a)** Explain the properties of flow net. **(6)**

b) An 8 m thick layer of saturated clay is overlain by 4.0 m deep sand. The water table is 2.0 m below the ground surface. The saturated clay and sand are 21 kN/m^3 and 19 kN/m^3 respectively. The unit weight of sand above the water table is 16 kN/m^3. Find out the total and effective vertical pressure at the water table, at top, middle, and bottom of clay layer. **(10)**

Q5 **a)** What are the factors that affect compaction? **(8)**

b) A monument 5000 kN is erected on the ground surface. Considering the load as concentrated, determine the vertical pressure directly under the monument at a depth of 10 m below the ground surface. Also calculate the vertical pressure at a point, which is at a deputation of 10 m and a horizontal distance of 5 m from the axis of the load. **(8)**

Q6 **a)** Describe the direct shear test. What are its merits and demerits compared to Triaxial test? **(6)**

b) Two identical specimens of soil were tested in a tri-axial apparatus. The first specimen failed at a deviator stress of 800 kN/m^2 when the cell pressure was 200 kN/m^2 while the second specimen failed at a deviator stress of 1400 kN/m^2 when the sell pressure was 300 kN/m^2. Determine c and ϕ for the soil. **(10)**

Registration No.:

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RME5D005

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Rapid Manufacturing Processes
BRANCH(S): MECH
Time: 3 Hours
Max Marks: 100
Q.Code: R033

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

- **a)** Differentiate between model and prototype.
- **b)** What is “Voxel”?
- **c)** Write down some applications of rapid prototyping technologies.
- **d)** What is meant by STL?
- **e)** Explain the benefits of reverse engineering.
- **f)** Classify the RP processes based on the type of raw material.
- **g)** Which RP technology is a hybrid process between additive and subtractive processes?
- **h)** Differentiate between NC and CNC.
- **i)** What is the need for support generation in RP processes?
- **j)** Write down the advantages of RP.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

- **a)** Briefly explain the errors generated due to data preparation, part building, build orientation, and surface finishing.
- **b)** Explain the fused deposition modeling process.
- **c)** Discuss the laminated object manufacturing process with a neat sketch.
- **d)** Describe the factors that influence the accuracy of RP Processes.
- **e)** Explain the uses of magic software.
- **f)** Explain the need for process optimisation and name any four technologies used for process optimisation.
- **g)** Illustrate the features of CAD-CAM data exchange.
- **h)** Discuss the steps involved in RP.
- **i)** Explain the features of internet-based RP software.
- **j)** What is the importance of rapid tooling?
- **k)** Explain the functions of mimic software.
- **l)** Briefly explain the binder jetting process.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Explain the various stages of product development. Discuss the cost involved in each stage of product development.	**(16)**
Q4	Explain the selective laser sintering process with its applications, advantages, limitations, and machine details.	**(16)**
Q5	What is meant by photopolymerisation? Explain the principle of the stereo lithography process with a neat diagram and write down its advantages, limitations, and applications.	**(16)**
Q6	Describe the basic principle of solid ground curing process with a neat sketch, including its applications and machine details.	**(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 03 **Course: B.Tech/IDD (B.Tech and M.Tech)**

Sub_Code: RCI5D001

5th Semester Regular/Back Examination: 2024-25

SUBJECT: Structural Analysis-II.

BRANCH(S): C&EE, CIVIL, CE

Time: 3 Hours

Max Marks: 100

Q.Code: R036

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) State the difference between force method and displacement method.

b) A continuous beam ACB fixed at end A, hinged C and B. Span length of AC is 4 m and CB is 10 m, flexural rigidity of span AC is same as span BC. Find the distribution factor for members at joint C.

c) Write assumptions made in slope deflection method.

d) What is the degree of static indeterminacy in a two hinged arch and in a fixed arch?

e) State the relation between stiffness matrix and flexibility matrix.

f) Find the shape factor for a circular section of diameter 400 mm.

g) A propped cantilever of span L carries a vertical concentrated load at the mid span. If the plastic moment capacity of the section is M_p, estimate the magnitude of the collapse load.

h) Differentiate between rotation factor and distribution factor.

i) Write the equation for displacement factor.

j) Calculate the horizontal thrust for a two hinged semi-circular arch of radius R subjected to point load W at crown.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

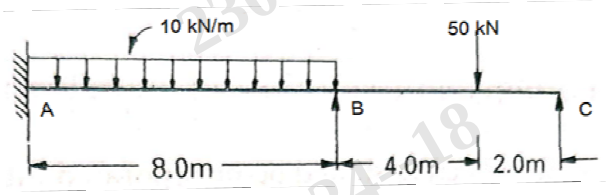
a) A continuous beam ABC consists of spans AB and BC of lengths 8 m and 12 m respectively. The span BC carries a uniformly distributed load of 12 kN/m, while a concentrated load 80 kN acts on centre of AB. The end A is fixed and C is simply supported. Find the support moments assuming EI constant for all members. Use slope defection method.

b) A continuous beam ABC consists of spans AB and BC of lengths 6 m and 8 m respectively. The span AB carries a uniformly distributed load of 10 kN/m, while a concentrated load 60 kN acts on centre of BC. The ends A and C are simply supported. Using moment distribution method, estimate the support moments assuming flexural rigidity of AB is twice of BC.

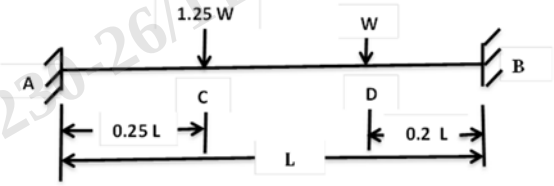
c) A continuous beam ABC consists of spans AB and BC of lengths 5 m and 10 m respectively. The span AB carries a uniformly distributed load of 50 kN/m, while span BC carries a uniformly distributed load of 60 kN/m. The end A is fixed and C is simply supported. Find the support moments taking same flexural rigidity for both the spans using Kani's method.

d) In arches bending moment is found to be less than that of a beam of same length, same loading and same flexural rigidity. Justify this. Draw figures to prove this. Also show different components and reactive forces acting on arches.

e) Analyze the continuous beam as shown below using stiffness matrix method. EI is same for both spans AB and BC.

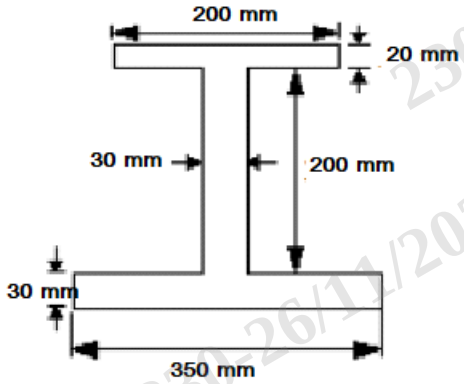


f) Determine the collapse load for the fixed beam shown below having plastic moment capacity M_p.



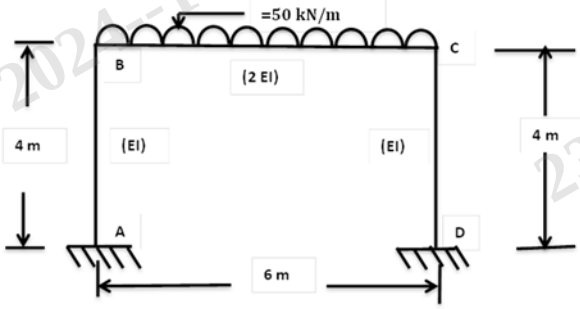
g) State the upper bound and lower bound theorems and write their applications.

h) Estimate the value of shape factor for the "I" section shown below.



i) Derive the sway correction factor of a single bay and single story frame.

j) Analyze the portal frame by slope deflection method and draw the moment diagram.



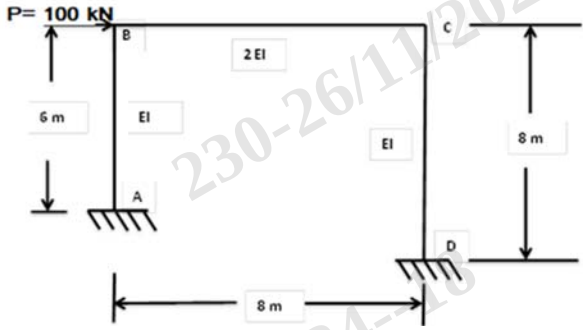
k) A two hinged parabolic arch of span 'L' and rise 'H' carries a uniformly distributed load of 'w' per unit run for a distance 'a' from the left end. Determine the horizontal thrust.

l) Write a short note on stiffness matrix

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

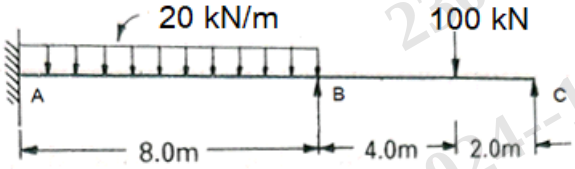
Q3 Analyze the portal frame ABCD shown below subjected to a horizontal force "P" of 100 kN at "B" by moment distribution method. Flexural rigidity of spans AB, BC, and CD are EI, 2EI, and EI respectively. **(16)**



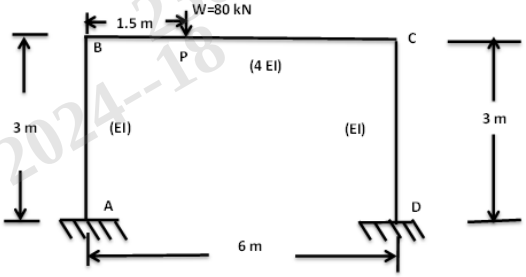
Q4 A two hinged parabolic arch of span 40 m and rise 6 m carries a uniformly distributed load of 35 kN/m for the left half of the span and a concentrated load of 120 kN at 10 m from right support. Assume $I = I_0 \sec\theta$, I_0 is the moment of inertia at crown and θ is the slope at the section under consideration. Determine the **(16)**

i. horizontal thrust
ii. Maximum positive and negative moment
iii. Shear force and normal thrust at 10m from the left support.

Q5 Analyze the two span continuous beam shown below when support B sinks down by 30 mm and support C sinks down by 10 mm using flexibility matrix method. EI of span AB = EI of span BC = 10.0 MNm^2. **(16)**



Q6 Analyze the portal frame ABCD as shown below. A point load W = 80 kN is acting at point "P" 1.5 m away from joint "B". Flexural rigidity of spans AB, BC, and CD are EI, 4EI, and EI respectively. Solve the problem using Kani's method. **(16)**



Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: RCI5C002

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Water and Waste Water Engineering
BRANCH(S): C&EE, CIVIL, ENV, CE
Time: 3 Hours
Max Marks: 100
Q.Code: R138

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Discuss different types of pumps used in water supply.
b) Describe the major waterborne diseases and their modes of transmission through contaminated water.
c) Discuss the working principles of Coagulation.
d) Write down different methods of disinfection.
e) Draw a schematic diagram of a conventional water treatment plant mentioning each unit.
f) Discuss the working of RBC with a neat sketch.
g) What are the functions of primary clarifier in waste water treatment plant?
h) Write down different hydraulic formulae for determining flow velocities for sewer and drain.
i) The 5 day at 20°C BOD test result of a 100 times diluted waste water sample is as follows: Initial dissolved oxygen: 7.1 mg/L, Final dissolved oxygen: 2.3 mg/L. Find BOD5?
j) Discuss the key parameters commonly regulated in effluent standards and their permissible limits.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) A pump is to deliver water from an underground tank against a static head of 40 m. The suction pipe is 50 m long and is of 25 cm diameter with Darcy-Weisbach friction factor f = 0.02. The delivery pipe is of 20 cm diameter, 1600 m long and f = 0.022. The pump characteristics may be expressed as $H_p = 100 - 6000\ Q^2$. Where H_p = pump head in meters and Q = discharge in m^3/sec. Calculate the head and discharge of the pump.
b) Evaluate the advantages and disadvantages of using surface water and groundwater as sources of drinking water.
c) What are the different methods of water softening? Describe Lime Soda method of water softening in detail.
d) Explain different waste water characteristics.
e) Discuss the different stages in sludge digestion process and factors affecting the process.
f) What is an intake? List the factors that govern the selection of a site for intake structure?

g) The population of a town is 10,000 and the average per capita demand is 200 L/p/d. Water is passing through a sedimentation tank which is 6 m wide, 15 m length and having a water depth of 3 m:

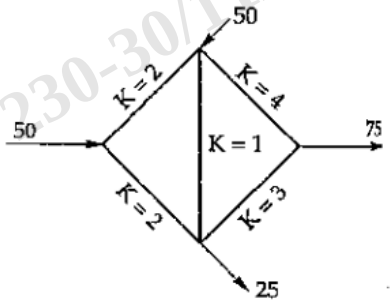
I. Find the detention time for tank.
II. What is average flow velocity through tank?
III. Compute the overflow rate.

h) Discuss the working principles of any of **three** water treatment processes: I. Sedimentation, II. Ion exchange, III. adsorption IV. Aeration

i) Design a sewer for a maximum discharge of 650 L/s running half full as well as running full. Consider Manning's rugosity coefficient n = 0.012, and gradient of sewer S = 0.0001.

j) Explain the working principle of a standard activated sludge process with the help of a neat sketch. Mention the advantages and disadvantage of this process.

k) Analyse the pipe network shown in the figure and tabulate the flow values in each pipe. Assume suitable values.



l) Distinguish between primary treatment and secondary treatment. Draw the flow diagram for treatment of sewage using activated sludge process.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Discuss any **eight** water quality parameters w.r.t. source, detection/analysis, impact and their significance. **(16)**

Q4 **a)** Differentiate between slow sand filter and rapid sand filter with reference to the following parameters (a) rate of filtration (b) efficiency (c) size (d) method of cleaning (e) period of cleaning (f) effective size [d_{10}] of sand. **(9)**

b) Differentiate between slow sand filter and rapid sand filter with reference to working principle/operation with neat sketches. **(7)**

Q5 Discuss the relative merits of the separate and combined systems of sewage and give the conditions favorable for the adoption of each one of them. Write different methods of estimation of storm water runoff. **(16)**

Q6 Discuss the working principles of trickling filter with a neat sketch and also discuss merits and demerits. Design a trickling filter to treat 5.0 MLD of sewage of BOD of 310 mg/l. The final effluent should be 40 mg/l and organic loading rate is 350 g/m^3/d. **(16)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
RCS5D006

5th Semester Reg/Back Examination: 2024-25
Computer Graphics
CST, CSEDS, CSE, CSIT, CSEAIME, IT
Time : 3 Hour
Max Marks : 100
Q. Code : R264

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define computer graphics.
b) What is the midpoint algorithm for circle generation?
c) Mention one advantage of random scan systems over raster scan systems.
d) What are graphics standards? Give an example.
e) How does character size affect character rendering?
f) Why is the order of transformations important in composite transformations?
g) What is the difference between diffuse reflection and specular reflection?
h) What is a mesh in 3D graphics?
i) What is the role of the viewing coordinate system in 3D viewing?
j) Define back-face detection.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Explain the working of any three graphics input devices, such as a light pen, joystick, and graphics tablet.
b) Compare and contrast CRT and LCD display devices.
c) Write the algorithm for drawing an ellipse and explain its working.
d) How are characters represented and rendered in computer graphics? Discuss the significance of fonts and styles.
e) Derive the matrix for reflection about the line $y = mx + c$.
f) Explain why the order of transformations matters in composite transformations. Support your answer with an example.
g) Differentiate between Bézier curves and B-spline curves.
h) Differentiate between parallel and perspective projection in 3D viewing.
i) What is the window-to-viewport transformation? Derive the formula and explain its significance.
j) Explain the concept of clipping in computer graphics. Why is it necessary?

k) Define ambient illumination and explain its role in rendering 3D scenes.

l) Explain the depth buffer method for visible surface detection. How does it work to resolve visibility issues?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Compare the DDA and Bresenham's algorithms for line generation. Discuss their advantages and limitations. **(16)**

Q4 Discuss the Cohen-Sutherland line clipping algorithm in detail. Explain all the region codes, bitwise operations, and decision-making processes involved. Provide a comprehensive example with a diagram. **(16)**

Q5 Explain the concepts of parallel and perspective projections in 3D graphics. Derive the projection transformation matrices for both, and provide examples of their applications. **(16)**

Q6 Explain the XYZ color model in detail. How does it relate to other color models like RGB and CMY? Discuss its applications in color management systems, including its use in monitors and printers. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)
RCS5C002

5th Semester Regular/Back Examination: 2024-25
Database Management Systems
CST, CSEAI, CSEDS, CSE, CSIT, CSEAIME, IT, CSE
Time: 3 Hour
Max Marks: 100
Q. Code: R125

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define the purpose of a database management system (DBMS).
b) What is the difference between schema and instance in a relational model?
c) Name the types of indices used in DBMS.
d) What are the advantages of using an ER diagram in database design?
e) Define functional dependency.
f) What is the significance of ACID properties in transaction processing?
g) Differentiate between primary and foreign keys.
h) What are the motivations for using database systems over traditional file systems?
i) Define 1NF with an example.
j) What are Armstrong's axioms for functional dependencies?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain the three-schema architecture of DBMS with a diagram.
b) Describe the concept of referential integrity with an example.
c) Give an example of a weak entity set and explain why is it weak?
d) Illustrate the use of SELECT and GROUP BY clauses in SQL with examples.
e) Describe the closure of a set of functional dependencies with an example.
f) Discuss the significance of BCNF and its role in database design.
g) Explain the process of logging and recovery in transaction management.
h) Differentiate between static and dynamic hashing techniques.
i) Describe the structure of a B+ tree and its use in indexing.
j) Explain the relational algebra operations UNION, INTERSECTION, and DIFFERENCE with examples.

k) Consider the following relation R(A,B,C,D,E,F) with a set of functional dependencies:
F = {A → BC, B → CD, D → EF, BC → AG, ABG → DF}
i. Find the closure of each determinant.
ii. Find the candidate key.

l) Given R(A, B, C, D, E, F) with FDs
{A → C, B → E, AB → C, C → D, E → F}.
Normalize R up to BCNF. Is it preserving dependency?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Consider the following relations: **(4+4+4 +4)**
PERSON(P_id, F_name, L_name, Occupation, Salary, City)
ORDER(O_id, P_id, Item, Quantity, Price, Order_date)

The Primary Keys are P_id and O_id respectively.
Express the following queries in SQL.
i. Find the person's name and city whose name starts with S.
ii. Find the name of the person who has ordered in the same date.
iii. Find the name of the person who hasn't ordered any item.
iv. Find the highest ordered item.

Q4 Design a complete database for a university system, including ER diagrams, schema, and SQL queries for student registration, course management, and grade calculation. **(16)**

Q5 What is conflict and view serializability. Consider the following non serial schedule: **(16)**

R1(X), R2(Y), W3(Z), W2(Y), W2(X), R1(Z), W3(Y), W2(X)

Check for conflict and view serializability.

Q6 Why do we require 2PL over lock-based protocol? How a deadlock is possible in 2PL. Explain different deadlock detection and prevention techniques. **(2+4 +10)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: REL5D004

5th Semester Regular/Back Examination: 2024-25
SUBJECT: ELECTRIC DRIVES
BRANCH(S): ELECTRICAL & C.E., EEE, EE
Time: 3 Hours
Max Marks: 100
Q.Code: R229
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is Electrical Drives? Draw its Block Diagram.
b) What are the advantages of Electrical Drives?
c) Why PWM inverter preferred over stepped wave inverter?
d) What are the disadvantages of rotor resistance control?
e) What do you mean by intermittent periodic duty? Explain briefly with wave forms.
f) Why series motor should not be used in those drives where there is a possibility of the load being dropped to the extent that the speed may exceed twice rated value?
g) How induction motor phase sequence can be reversed?
h) What are the limitations of stator voltage control of 3-phase induction motor?
i) What do you mean by regenerating braking of DC motor?
j) Draw the duty cycle of traction drives.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) A drive has the following parameters: J =10 kg-m^2, T = 100-0.1N, N-m, Passive Load Torque T_L = 0.05N, N-m, where N is the speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristics is changed to T = -100-0.1N, N-m. Calculate the time of reversal.
b) What are the various classes of motor duty? Explain with suitable waveforms.
c) Explain the various dc motor speed - torque characteristics and their performance with suitable mathematical expression and diagrams.
d) A 200 V, 10.5 A, 2000 rpm shunt motor has the armature and field resistance of 0.5 Ω and 400 Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate motor speed if the source voltage drops to 175 V.
e) Explain the Plugging operation of dc motors.

f) Explain the variable frequency control of an induction motor drive with neat sketch diagram.

g) Explain the VSI control of induction motor drive with suitable diagrams.

h) Explain the CSI control of induction motor drive with suitable diagrams. What are the advantages of CSI over VSI.

i) Explain four quadrant operation of a motor driving a hoist load with suitable diagram.

j) Explain torque and power limitations in combined armature voltage and field control of separately excited dc motor with suitable diagram.

k) Explain various modes of variable frequency control of synchronous motor drives.

l) Explain the operation of 25 kV, 50 Hz ac traction using on-load transformer tap changer.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Explain the various methods of speed control of dc motor. **(8)**

b) A 220V, 970 rpm, 100 A DC separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000 rpm. Calculate (a) resistance to be placed in armature circuit to limit braking current to twice the full load value (b) braking torque (c) torque when the speed has fallen to zero. **(8)**

Q4 **a)** What are slip power recovery schemes? Explain. **(4)**

b) Explain the various slip power recovery schemes of three phase induction motor with suitable diagram. **(12)**

Q5 **a)** Derive the expression for Tractive Effort and torque per motor of an electric train. **(8)**

b) A 100 tonne motor coach is driven by 4 motors, each developing a torque of 5000 Nm during acceleration. If up-gradient is 50 in 1000, gear ratio a = 0.25, gear transmission efficiency 98 %, wheel radius 0.54 m, train resistance 25 N/tonne, effective mass on account of rotational inertia is 10% higher, calculate the time taken to attain a speed of 100 kmph. **(8)**

Q6 **a)** Write short notes on Steel Rolling Mill. **(6)**

b) Explain the different operations carried out in a textile mill. What are the electrical drives used for these operations? **(10)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**
Sub_Code: REL5D001

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Electrical Machine Design
BRANCH(S): Electrical
Time: 3 Hours
Max Marks: 100
Q.Code: R172
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is the advantage of bar winding in synchronous machine?
b) Draw the torque speed characteristics of a double case induction motor.
c) What is crawling in induction motor?
d) Why are you skewing the rotor slots in induction motor?
e) What is the Maximum temperature limit for class B insulation?
f) A transformer is working at its maximum efficiency. Its iron loss is 2000 W. Find the copper loss.
g) What is the function of the damper winding?
h) How to choose the armature slots for synchronous machine?
i) What is the most suitable material used for the transformer core?
j) How to choose the number of poles in DC machine?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain the steps to design the field winding of synchronous machine.
b) Find the main dimensions of a 200 KW, 250 V, 6 pole, 1000 r.p.m. generator. The maximum value of flux density in the gap is 0.87 wb/m^2 and the ampere conductors per meter of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percentage. Assume the ratio of length of core to pole pitch = 0.75.
c) Find the minimum number of poles for a 120 KW generator if the average voltage between commutator segments is not to exceed 15 and the armature mmf per pole is not to exceed 10,000 A.
d) Formulate the output equation of a d.c. machine.
e) Compare the difference between squirrel cage and wound rotor induction motor.
f) Give the winding details for a 4 pole, 36 slot, 72 segment d.c. armature with 8 parallel paths.

g) Derive the output equation of the 3-phase induction motor.

h) How the length of the airgap greatly influences the performance of the synchronous machine?

i) Write down the advantage of squirrel cage induction motor over wound rotor induction motor.

j) Calculate the diameter and length of armature for a 7.5 KW, 4 pole, 1000 r.p.m., 220 V shunt motor. Given: full load efficiency = 0.83; maximum gap flux density = 0.9 Wb/m^2; specific electric loading = 30,000 armature conductors per meter; field form factor = 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5 % of the rated current. The pole face is square.

k) Explain the advantage of the bar winding as compared with a winding with multi-turn coils in synchronous machine.

l) Explain the effect of SCR on the synchronous machine performance.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A 30 KW, 400 V, 50 Hz, 6 pole star connected slip ring induction motor has the following design data. Stator core diameter = 0.4 m, efficiency = 90 %, p.f. = 0.8, flux per pole = 12 mwb. Determine the followings: **(16)**

a) Number of stator slots b) number of rotor slots c) Number of rotor conductors. Assume any other data.

Q4 Determine suitable stator dimensions for a 500 KVA, 50 Hz, 3 phase alternator to run at 375 rpm. Take mean gap density over the pole pitch as 0.55 wb/m^2, the specific electric loading as 25000 A/m. The peripheral speed should not exceed 35 m/s. **(16)**

Q5 Calculate the core and window areas required for a 1000 KVA, 6600/400 V, 50 Hz, single phase core type transformer. Assume a maximum flux density of 1.25 Wb/m^2 and current density of 2.5 A/mm^2. Voltage per turn = 30 V, and window space factor = 0.32. **(16)**

Q6 Derive the output equation for single phase transformers. **(16)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02

B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)

RCS5C001

5th Semester Reg/Back Examination: 2024-25

Formal Languages and Automata Theory

CST, CSEDS, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, ELECTRONICS & C.E, IT, CSE

Time : 3 Hour
Max Marks : 100
Q. Code : R173

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Construct a CFG over {a,b} generating a language consisting of equal number of a's and b's. Construct a CFG over {a,b} generating a language consisting of equal number of a's and b's.

b) Specify the use of context free grammar.

c) Design a DFA over ∑ = f {a, b} such that every string will be accepted must ends with 'aa' or "bb

d) Is the language of Deterministic PDA and Non – deterministic PDA same?

e) Classify different types of Turing Machine

f) Define Arden's theorem

g) Can a context-free grammar generate an infinite language?

h) What do you mean by complement of DFA? Explain with suitable example

i) Name any four closure properties of regular languages

j) State the halting problem of Turing machine.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) What are the applications of Turing Machine?

b) Compare and contrast the Moore machine and Mealy machine models of finite state machines. Provide five distinct points of comparison.

c) Apply the identities of regular expressions to prove the following: (1+00*1)+(1+00*1)(0+10*1)*(0+10*1) = 0*1(0+10*1)*.

d) Convert the following grammar into CNF S→cBA, S→A, A→cB, A→AbbS, B→aaa

e) Construct a minimum state automaton equivalent to given automaton whose transition table is given below:

States/Input	a	b
→q0	q1	q3
q1	q2	q4
q2	q1	q4
q3	q2	q4
*q4	q4	q4

f) Are there any languages which are not recursively enumerable, but accepted by a multi-tape Turing machine? Justify your answer.

g) Construct ϵ - NFA for the regular expression R = (cd | c)*. Construct the equivalent DFA by ϵ-closure method for the given regular expression

h) Consider the grammar G, where the productions are

E→F – E | E – F | F

F → a | b

Prove that the Grammar is ambiguous for the string a – b

i) Convert the following grammar into an equivalent one with no unit productions and no useless symbols S→ABA A→aAA|aBC|bB B→ A|bB|Cb C→CC|Cc

j) Does a Push down Automata have memory? Justify.

k) List the main application of pumping Lemma in CFL's

l) Are NPDA (Nondeterministic PDA) and DPDA (Deterministic PDA) equivalent? Illustrate with an example.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the Chomsky hierarchy of languages, including the four types of languages and their associated grammars. **(16)**

Q4 Let G be the grammar: S→0B |1A, A→0 |0S |1AA, B→1|1S|0BB. For the string 00110101 find: (a) The leftmost derivation (b) The rightmost derivation (c) The derivation tree **(5+5+6)**

Q5 What is the purpose of normalization? Construct the CNF and GNF for the following grammar and explain the steps: S→aAa | bBb |€ A→C|a B→C|b C→CDE | € D→A|B|ab. Constuct a CFG for the regular expression (011+1)(01) **(2+8+6)**

Q6 Discuss variants of Turing Machine. Design a Turing Machine that will accept the language **$L = \{0^n1^n \mid n \geq 1\}$.** **(4+12)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech & M.Tech)**
Sub_Code: RME5C003

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Heat Transfer
BRANCH(S): MMEAM, MECH, ME
Time: 3 Hours
Max Marks: 100
Q.Code: R176

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What are the basic laws used in deriving the heat conduction equation?
b) Write the vectorial form of Fourier's law of heat conduction equation.
c) For solving two-dimensional unsteady state heat conduction in a solid, how many initial and boundary conditions are required?
d) What is a fin or an extended surface? Where are they used?
e) Define fin efficiency and fin effectiveness.
f) What do you mean by velocity and thermal boundary layers on a flat plate?
g) Define Nusselt number and explain its physical significance.
h) Define Grashof number and explain its physical significance.
i) State Wien's displacement law.
j) Define Log Mean Temperature Difference for heat exchangers.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Derive the general heat conduction equation in Cartesian coordinates.
b) A plastic panel of area A = 0.09 m^2 and thickness L = 0.84 cm is found to conduct heat at the rate of 5 W at steady state with a temperature of 26° C on the left surface and a temperature of 24° C on the right surface. What is the thermal conductivity of the plastic at 25° C?
c) A steel pipe (k = 45.0 W/m. K) having a 5 cm outer diameter is covered with a 4.2 cm thick layer of magnesia (k = 0.07 W/m. K) which is in turn covered with a 2.4 cm layer of fiberglass insulation (k = 0.048 W/m. K). The pipe wall outside temperature is 370 K and the outside surface temperature of the fiberglass is 305 K. What is the interfacial temperature between the magnesia and the fiberglass?
d) Find the relation for the rate of heat flow through a single-layered plane wall composed of a material whose thermal conductivity varies as $k = k_o(1 + bT + cT^2)$.
e) Two long rods of the same diameter, one made of brass (k = 85 W/m.K) and the other made of copper (k = 375 W/m.K) have one of their ends inserted into a furnace. Both the rods are exposed to same environment. At a distance of 105 mm away from the furnace, the temperature of brass rod is 120°C. At what distance from the furnace, the same temperature would be reached in the copper rod?

f) A thin fin of length L has its two ends attached to two parallel walls which have temperatures T_1 and T_2. The fin loses heat by convection to the ambient air at T_∞. Obtain an analytical expression for the one-dimensional temperature distribution along the length of the fin.

g) It is better to use 10 fins of 5 cm length than 5 fins of 10 cm length. State and prove corrections of the statement. Take properties as follows:
Diameter of fin = 15 mm.
Thermal conductivity = 45 W/m K
Heat Transfer coefficient = 95 W/m^2 K

h) A vertical plate 0.5 m high and 1 m wide is maintained at uniform temperature of 124°C. It is exposed to ambient air at 30°C. Calculate the heat transfer rate from the plate. Take properties of air:

$\nu = 2.076 \times 10^{-5} \frac{m^2}{s}$, Pr=0.697, $k_{air} = 0.03$ W/mK

i) Air at 350 K and standard atmospheric pressure ($\nu = 2.076 \times 10^{-5}\ m^2/s$) flows along a smooth flat plate at 12 m/s. For laminar flow, at what length from the leading edge does the boundary layer thickness reach 0.5 cm?

j) Calculate the view factor between two opposite sides of a hollow cube, if view factor between two adjacent sides of it is 0.2.

k) Hot oil is used to heat water, flowing at the rate of 0.1 kg/s, from 40° C to 80° C in a counterflow double-pipe heat exchanger. For an overall heat transfer coefficient of 300 W/m^2. K, find the heat transfer area if the oil enters at 105°C and leaves at 70°C.

l) Derive an expression for log mean temperature difference of parallel flow heat exchanger. How this expression can be modified for counter flow heat exchanger.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A furnace wall has the inside surface temperature of 1100° C, while the ambient air temperature is 25° C. The wall consists of 125 mm thick refractory bricks (k = 1.6 W/m K), 125 mm thick firebricks (k = 0.3 W/m K) and 12 mm thick plaster (k = 0.14 EW/m K). There is an air gap between refractory bricks and fire bricks which offers a thermal resistance of 0.16 K/W. The heat transfer coefficient on the outside wall to the air is 17 W/m^2 K. Determine (a) the rate of heat loss per unit area of wall surface, (b) the interface temperatures throughout the wall, and (c) the temperature of the outside surface of the wall. **(16)**

Q4 Derive expression for temperature distribution in a straight fin of rectangular profile for insulated tip. **(16)**

Q5 Assuming linear velocity and temperature profiles, carry out the integral analysis of the thermal boundary layer on an isothermal flat plate for Pr $\geq$ 1 and obtain an expression for the local Nusselt number as a function of Reynolds number and Prandtl number. For linear velocity profile: **(16)**

$(\delta/x) * (Re_x)^{1/2} = 3.46$

Q6 Derive expression for parallel flow and counter flow heat exchangers. **(16)**

Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **IDD (B.Tech and M.Tech)**
RME5C002

5th Semester Regular/Back Examination: 2024-25
Mechanisms and Machines
BRANCH(S): MMEAM, MECH, ME
Time: 3 Hours
Max Marks: 100
Q.Code: R130

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is a cam? What are the basic types of cams?
b) What is lift or stroke in radial cams?
c) Why Ackerman steering gear is preferred to the Davis steering gear mechanism?
d) What are the significances of turning moment diagram?
e) State the law of gearing.
f) What is Sensitiveness of Governor?
g) What do you understand by gyroscopic couple?
h) What is the significance of dynamic balancing in rotating component?
i) Define free and forced vibration.
j) What do you mean by vibration isolation?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Briefly explain the different types of followers with neat sketch.
b) Draw the displacement, velocity, and acceleration diagrams when the follower moves with simple harmonic motion.
c) The angle between the axes of two shafts connected by Hooke's joint is 20°. Determine the angle turned through by the driving shaft when the velocity ratio is maximum and unity.
d) The mass of flywheel of an engine is 10 tonnes and the radius of gyration is 1.8 metres. It is found from the turning moment diagram that the fluctuation of energy is 56 kN-m. If the mean speed of the engine is 100 rpm, find the maximum and minimum speeds.

e) The pitch circle diameter of the smaller of the two spur wheels which mesh externally and have involute teeth is 100 mm. The number of teeth are 16 and 32. The pressure angle is 20° and the addendum is 0.32 of the circular pitch. Find the length of the path of contact of the pair of teeth.

f) Calculate the vertical height of a Watt governor when it rotates at 80 rpm. Also find the change in vertical height when its speed increases to 81 rpm.

g) Differentiate governor with fly wheel in brief.

h) Explain the effect of gyroscopic couple on aero planes with schematic diagram.

i) Explain the method of balancing of different masses revolving in the same plane.

j) Four masses m_1, m_2, m_3, and m_4 are 200 kg, 300 kg, 240 kg, and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m, and 0.3 m respectively and the angles between successive masses are 60°, 105°, and 150°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.3 m.

k) Briefly explain the over damping, under damping, and critical damping conditions for a free damped vibration system.

l) A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 30 kg at its free end. The Young's modulus for the shaft material is 230 GPa. Determine the frequency of longitudinal and transverse vibrations of the shaft.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Derive the expression of correct steering for Davis Steering Gear Mechanism with neat sketch. **(16)**

Q4 With a neat sketch, explain the turning moment diagram of a single cylinder double acting steam engine. **(16)**

Q5 With a neat sketch, explain the terms and derive expressions for ‘effort’ and ‘power’ of a Porter governor. **(16)**

Q6 Discuss briefly with neat sketches the longitudinal, transverse and torsional free vibrations. Also, derive an expression for the natural frequency of free transverse and longitudinal vibrations by equilibrium method. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: REC5C003

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Microprocessors & Microcontrollers
BRANCH(S): ECE, ETC, EC
Time: 3 Hours
Max Marks: 100
QP.Code : R074
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Mention the valid register pairs of 8085 microprocessor.
b) Mention the function of instruction queue in 8086 microprocessors.
c) Mention the 16-bit registers of 8085 microprocessor.
d) Why the data bus is bi-directional in a microprocessor system.
e) How a keyboard matrix is formed in keyboard interface?
f) What is the purpose of control word written to control register in 8255?
g) What is the special function register in 8051?
h) Mention two power saving mode of operation in 8051.
i) Mention at least two machine cycles of 8085 mpu.
j) What do you mean by memory mapping and I/O mapping?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Explain in brief about different types of addressing modes of 8086 instruction set.
b) Write an ALP to sort the given numbers in ascending order in 8085.
c) With suitable diagram explain the architecture of PPI 8255.
d) What do you mean by vectored interrupts of 8085 microprocessor? Explain the priorities.
e) Describe the data storage scheme in a stack structure of 8051 microcontroller.
f) Give a comparison of minimum mode and maximum mode pins.
g) What is a segment? Explain the segmentation in 8086 and list the advantages of having segmentation.
h) Explain the different serial communication modes in 8051.
i) Write an 8051 ALP to find the average of given N numbers.
j) Explain architecture of 80386 with neat diagram.

k) Write an ALP using 8086 instructions to reverse a four-digit number.

l) With a timing diagram, explain 8085 microprocessor bus activities during a memory write operation.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 With neat sketch explain how LCDs are interfaced with 8051 Microcontroller. **(16)**

Q4 Draw the schematic for interfacing a stepper motor with 8051 microcontroller and write 8051 ALP for stepper motor control. **(16)**

Q5 Explain the classification of 8085 microprocessor instruction set with examples. Explain how various control signals are generated in 8085 microprocessors, for external operations. **(16)**

Q6 Explain the steps involved in interfacing an alarm controller with 8086 microprocessor and explain details with neat sketch. **(16)**

Registration No.:

Total Number of Pages: 03

B.Tech
/Integrated Dual Degree (B.Tech and M.Tech)
RCS5C003

5th Semester Regular/Back Examination: 2024-25
Operating System
CST, CSEAI, CSEDS, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, ELECTRONICS & C.E, IT, CSE
Time: 3 Hour
Max Marks: 100
Q.Code: R075
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

- **a)** Define an Operating System and list its main functions.
- **b)** What are system calls? Provide two examples.
- **c)** Differentiate between a process and a thread.
- **d)** What is a virtual machine in the context of Operating Systems?
- **e)** Briefly explain the concept of multithreading.
- **f)** What are semaphores? Provide one use case.
- **g)** What is a file system? Mention its key purpose.
- **h)** What is demand paging in virtual memory management?
- **i)** State the significance of system protection in an OS.
- **j)** Define contiguous memory allocation.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

- **a)** Explain the fork() system call. Explain its functionality with the code: main(){fork(); print("Hello");}
- **b)** Explain the abstract view of an Operating System with a neat diagram.
- **c)** Discuss the role and significance of threads in a modern OS.
- **d)** What are monitors, and how are they used in process synchronization?
- **e)** Explain hardware synchronization techniques for process coordination.
- **f)** Discuss the key methods for handling deadlocks in detail.
- **g)** Compare and contrast contiguous and non-contiguous memory allocation techniques.
- **h)** Explain system protection and its role in ensuring security.
- **i)** Explain the working of the Least Recently Used (LRU) page replacement policy.
- **j)** Discuss various disk scheduling algorithms with an example for each.
- **k)** What are distributed file systems? Provide an example and its use case.

I) Consider three concurrent processes P1, P2 and P3 as shown below, which access a shared variable D that has been initialized to 555.

P1	P2	P3
. .	. .	. .
D = D - 55	D = D + 66	D = D - 44
. .	. .	. .

The processes are executed on a uniprocessor system running a time-shared operating system. Find out the minimum and maximum possible values of D after the three processes have completed execution.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Consider the following CPU processes with arrival times (in milliseconds) and length of CPU bursts (in milliseconds) as given below: **(16)**

Process	Arrival Time	Burst Time
P1	0	5
P2	1	1
P3	3	3
P4	4	2

a. What will be the Average Waiting Times and Turn Around Time if non-preemptive SJF scheduling is adopted?

b. What will be the respective Average Waiting Times and Turn Around Time if SRTF scheduling is adopted?

Q4 A system uses FIFO policy for page replacement. It has 4-page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then access the same 100 pages but now in the reverse order. How many page faults will occur? **(16)**

Q5 A system has three resource types of namely A, B, and C. The number of instances from each type are 8, 6, and 4, respectively. At a particular timestamp, the system has the following resource allotment status: **(16)**

Process	MAX			ALLOCATION		
	A	B	C	A	B	C
P1	6	3	2	1	0	1
P2	5	2	1	1	2	0
P3	2	1	1	2	1	0
P4	2	2	1	1	1	1

Whether the system is in safe state? Whether a new request of <1, 1, 0> from P4 can be granted?

Q6 Consider the request queue (0-199) i.e. 200 tracks and the order of request are 82, 170, 43, 140, 24, 16, 190 and current position of Read/Write head is 50. What is the total seek time of using the FCFS, SSTF, SCAN and LOOK disk scheduling algorithm. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: B.Tech / IDD
Sub_Code: RCI5D004

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Railway and Airport Engineering
BRANCH(S): C&EE, CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: R277

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What are the different gauges used in Indian railway?
b) What are the function of check rail and wing rail?
c) Mention various type of Rail section used in Indian Railways for B. G. track.
d) What is the difference between Staggered joint and Square joint?
e) Write are the advantage of welding of Rails.
f) What are the classifications of waterways?
g) Define Hauling Capacity. Calculate the weight of rail required for a locomotive of axle load of 20 tones.
h) Define Calm period. What is the necessity.
i) What is cross wind component? Mention their standard values.
j) Define Breakwater.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) What are the requirements of an ideal permanent way?
b) What are the requirements of good ballast?
c) What are the methods to reduce the wear of rail?
d) Calculate maximum permissible train load that can be pulled by a locomotive having 3 pairs of driving wheels carrying an axle load of 25 tons each. The train has to run at a speed of 75 kmph on a straight MG track. Also calculate the reduction in speed if the train has to climb a gradient of 1 in 150 with a 3º radius of curve.
e) Briefly explain about the CST-9 Sleeper.
f) What are the merits and demerits of bearing plates used in Indian rail?

g) If a 6^o curve track diverges from a main curve of 4^o in an opposite direction in the layout of M. G. Yard, calculate the superelevation and the speed on the branch line, if the maximum speed permitted on the main line is 50 kmph.

h) What are the geometric elements of Taxiway? Mention the standard values.

i) Explain the working principle of semaphore signal.

j) Calculate the all the necessary elements required to set out a I in 12 turnouts, taking off from a straight BG track with its curve starting from the toe of the switch. Heel divergence is 10.5 cm.

k) What are the significances of different types of imaginary surface of Airport?

l) Mention the factors which govern the choice of site for a Harbor.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Draw the schematic diagram of the cross section of a BG railway track in embankment. Explain its component parts. Briefly explain the problem in multi gauge system. **(16)**

Q4 The length of the runway under standard conditions is 2500 m. The airport is to be provided at elevation of 400 m above the mean sea level. Determine the length of runway as per ICAO and FAA with fallowing data: **(16)**

- Mean of the maximum daily temperature is 44^oc
- Mean of the average daily temperature is 27^oc

End to end runway (m)	Grade (%)
0 - 300	+1.00
300 - 900	–0.4
900 - 1500	+0.5
1500 - 1800	+0.8
1800 - 2100	–0.5
2100 - 2700	–0.3
2700 - 3000	+0.2

Q5 Draw the schematic diagram of Left hand Turn out and Right hand Turn out. Discuss in brief the basic function of its various components. **(16)**

Q6 Briefly explain the importance of Inland water transport in India. How does it affect the Indian economy? **(16)**