Registration No.:

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Artificial Intelligence and Machine Learning
BRANCH(S): AEIE, AUTO, C&EE, CIVIL, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, MECH, EE, ME
Time: 3 Hours
Max Marks: 100
Q.Code: S028
Answer Question No.1 (Part-I) 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 function of an expert system shell?
b)   What does "searching with partial information" mean?
c)   Write the formula used in A* search.
d)   State the purpose of evaluation functions in games.
e)   Mention one difference between propositional and first-order logic.
f)   What does it mean when two events are conditionally independent?
g)   List two advantages of using Bayesian Networks.
h)   Write Bayes' Rule in mathematical form.
i)   Mention one difference between induction and deduction.
j)   Define analogy-based learning.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**
a)   How does an agent interact with its environment? Discuss with a block diagram.
b)   Compare and contrast uninformed search strategies: BFS vs. Uniform Cost Search.
c)   Explain unification with an example. Why is it important in First-Order Logic?
d)   Describe how evaluation functions are designed in adversarial search.
e)   Discuss the importance and steps involved in knowledge engineering in First-Order Logic.
f)   What is the significance of independence and conditional independence in probabilistic reasoning?
g)   Explain how a full joint probability distribution is used for inference. Provide a small table-based example.
h)   Describe the concept of acting under uncertainty with an AI agent example.
i)   Differentiate between rote learning and learning by taking advice.

j) What is formal learning theory? Mention its significance in AI.

k) Describe the working of depth-limited search and iterative deepening search.

l) What is learning with hidden variables? Illustrate with a use case.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)   **(16 x 2)**

Q3   Explain the concept and implementation of means-end analysis in problem solving. How is it different from state-space search?   **(16)**

Q4   Discuss the role of evaluation functions in games. How do they help in making decisions when search depth is limited?   **(16)**

Q5   Describe the structure, semantics, and construction of a Bayesian Network. Explain how it captures probabilistic relationships between variables.   **(16)**

Q6   Describe the working of genetic algorithms in machine learning. Include the concepts of selection, crossover, and mutation with an example.   **(16)**

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: RME6C001

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Design of Machine Elements
BRANCH(S): MECH, MMEAM
Time: 3 Hours
Max Marks: 100
Q.Code: S075
Answer Question No.1 (Part-I) 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 factor of safety? Discuss its importance
   b) What is meant by the efficiency of a riveted joint?
   c) Name the modes of failure of a cotter in the cotter joint and mention the role of gib in a cotter joint.
   d) Why Wahl's factor is to be considered in the design of helical compression or tension springs?
   e) A leaf spring with graduated leaves is a beam of uniform strength. Explain
   f) In what situation flexible coupling is used?
   g) What is nipping of leaf spring?
   h) What are preferred numbers?
   i) Mention the assumptions made in the design of the keys.
   j) What are the different types of stresses induced in bolts?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**
   a) Two steel shafts of 50 mm diameter are connected by means of a flange coupling. The flanges are welded on the shaft ends. Determine the size of the welds required on the surface of each shaft, both on the inner and outer faces of the flange, to transmit full torque capacity of the shafts. Assume the permissible shear stress in the shaft is 60 MPa, and that in the weld is 95 MPa.
   b) How a shaft is different from an axle? Differentiate between strength design and rigidity design of shaft.
   c) A journal bearing, 100 mm diameter and 150 mm long; carries a radial load of 7 kN at 1200 r.p.m. The diametral clearance is 0.075 mm. Find the viscosity of the coil being used at the operating temperature, if 1.2 kW power is wasted in friction.
   d) State the following theories of failure and their use
      I. Maximum principal stress theory of failure
      II. Maximum shear stress theory of failure
   e) Discuss in detail about the factors which govern the selection of material for the machine components.
   f) A hollow shaft is subjected to a maximum torque of 1.5 kN-m and a maximum bending moment of 3 kN-m. It is subjected, at the same time, to an axial load of 10 kN. Assume that the load is applied gradually and the ratio of the inner diameter to the outer diameter is 0.5. If the outer diameter of the shaft is 80 mm, find the shear stress induced in the shaft.
   g) A turbine shaft transmits 400 kW at 1000 rpm. The permissible shear stress is 80 N/mm^2 while twist is limited to 0.5^0 in a length of 2.5 m. Calculate the diameter of shaft. Take $G = 8 \times 10^4$ N/mm^2. If the shaft is chosen to be hollow with $d_i/d_o = 0.6$, calculate the % saving in the material.
   h) The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to the maximum principal stress theory of failure.

i) A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are $\sigma_t = 120 MPa; \tau = 100 MPa;\ and\ \sigma_c = 150 MPa$

Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.

j) A single riveted lap joint is made in 15 mm thick plates with 20 mm diameter rivets. Determine the strength of the joint, if the pitch of rivets is 60 mm. Take $\sigma_t = 120 MPa; \tau = 80 MPa;\ and\ \sigma_c = 160 MPa$.

k) What do you mean by endurance strength of a material? How do the size and surface condition of a component and type of load affect such strength?

l) Write short notes (any two)
  I. Stages in design
  II. Endurance limit and factors affecting it
  III. Notch sensitivity

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)   (16 x 2)

Q3 a) A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm². It is held on its seat by a **(8)** close coiled helical spring. The maximum lift of the valve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of the wire is limited to 500 MPa. The modulus of rigidity for the spring material is 80 kN/mm². Calculate: i. Diameter of the spring wire, ii. Mean coil diameter, iii. Number of active turns, and iv. Pitch of the coil.
Take Wahl's factor,

$$K = \frac{4C-1}{4C-4} + \frac{0.615}{C} = 1.31$$

Where C is the spring index.

b) A locomotive semi-elliptical laminated spring has an overall length of 1m and sustains a load of 70kN **(8)** at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 MPa, when fully loaded. The ratio of the total spring depth to that of width is 2. E = 210 kN/mm². Determine
  (i)   The thickness and width of the leaves
  (ii)   The initial gap that should be provided between the full length and graduated leaves before the band load is applied.
The load exerted on the band after the spring is assembled.

Q4 a) Design a journal bearing required to resist a radical load of 8 kN. The oil used has a viscosity of **(8)** 0.0087 kg/m-s at the operating temperature of 80⁰C. Shaft speed is 720 RPM. Bearing diametral clearance may be assumed as 0.00025 mm per mm diameter, and ambient temperature is 30⁰C. If heat radiating capacity of the bearing is 150 N-m per second per square meter of projected area of bearing per ⁰C; determine whether artificial cooling is necessary?

b) A foot-step bearing supporting a vertical shaft is required to resist a load of 7 kN, while the shaft **(8)** running at 120 RPM. Allowable bearing pressure is 2 N/mm². If the coefficient of friction is 0.05, calculate the power lost in friction at the bearing.

Q5 A rectangular steel plate 100 mm wide is welded to a vertical plate to form a cantilever with an overlap **(16)** of 50 mm and an overhang of 150 mm. It carries a vertical downward load of 60 kN at free end. Fillet weld is done three sides of the plate for a permissible stress of 140 N/mm². Determine the size of the weld.

Q6 A knuckle joint is to transmit a force of 140kN, Allowable stresses in tension, shear and compression **(16)** are 75 N/mm², 65 N/mm² and 140 N/mm² respectively. Design the joint.

Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)
Sub_Code: RCI6C001

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Design of Steel Structures
BRANCH(S): C&EE, CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: S203
Answer Question No.1 (Part-I) 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 permissible)

Part-I

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

a) List out the important properties of structural steel.

b) Distinguish between characteristics loads and design loads.

c) State the principles observed in the design of connections in steel structures.

d) Define design strength of a tension member.

e) Explain the term pitch of bolts and gauge distance.

f) Define slenderness ratio of a column.

g) How torsional rotation of a beam is prevented?

h) What is lug angle? Why lug angles are used?

i) What is a plate girder? Where it is used?

j) In class 4.6 bolts, what do the number 4 & 6 indicate?

Part-II

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

a) Explain the advantages and disadvantages of using steel structures.

b) List the assumptions made in the design of bearing bolts.

c) Discuss different types of welded joints with neat sketches.

d) Explain different modes of failure of tension members.

e) Two plates 16 mm are to be jointed using M20 bolts of grade 4.6 in lap joint. Determine the bolt value.

f) Two 12 mm thick plates are joined by 160 mm long (effective) butt weld. Determine the strength of the joint if a double U butt weld is used.

g) With neat sketches explain different types of column bases.

h) Discuss lacing and battening column systems with neat sketches.

i) Differentiate between web bucking and web crippling of a beam.

j) State some advantages and disadvantages of plate girders over trusses.

k) Determine the design axial load capacity of the column ISHB 300 @ 577N/m. If the length of the column is 3 m and its both ends pinned.

l) Derive the expression for the economical depth of a plate girder. Assume moment is resisted by flanges only.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Design a suitable longitudinal fillet weld to connect 120 x 8 mm plate to 150 x 10 mm plate to transmit a pull equal to full strength of small plate. Assume welding is to be made in the field. **(16)**

Q4 Design a tension member to carry a factored force of 340 kN. Use 20 mm diameter black bolts and a gusset plate of 8 mm thickness. **(16)**

Q5 Design a gusseted base to carry an axial factored load of 3000 kN. The column is ISHB 450 @ 855 N/m with two 250 x 22 mm cover plates on either side. The effective height of the column is 5 m. The column is rest on M20 concrete pedestal. **(16)**

Q6 Design a simply supported beam of 5 m effective span carrying a load of 20 kN/m. The compression flange is laterally unsupported. Assume fy =250 Mpa. **(16)**

6th Semester Regular/Back Examination: 2024-25
Electric Power System Protection
BRANCH(S): ELECTRICAL
Time: 3 Hour
Max Marks: 100
Q.Code : S205
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 RRRV? Explain its significance.

  b) Identify the type of fault if the positive sequence component of voltage at the point of fault is zero.

  c) What is meant by auto-reclosing action in power system protection?

  d) What is the significance of sensitivity in the protection systems?

  e) What is the impact of fault clearing time on the operation of protective devices?

  f) What is the effect of CT saturation on the design of protective relaying systems?

  g) What do you mean by under reach and over reach of a relay?

  h) Draw the zero-sequence network for a Δ - Y connected 3-phase transformer.

  i) What is meant by current chopping?

  j) What do you mean by TSM? How it affects the performance of a relay?

Part-II

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

  a) With a neat sketch, explain the recovery rate theory and energy balance theory of arc interruption in circuit breaker.

  b) What is an impedance relay? Explain the operating principle, torque equation, and operating characteristics for impedance relay.

  c) Write a short note on "Buchholz relay" used for the protection of transformers to detect incipient fault.

  d) Discuss the working principle of coincidence type phase comparator? Derive the mathematical expressions related to it.

  e) With a neat sketch explain the working of differential protection of 3-Phase circuits and balanced (opposed) voltage differential protection

  f) What are the protective devices employed for the protection of an alternator against I) Overvoltage and II) Overspeed? Discuss them in brief.

  g) Derive the general equations of magnitude comparator incorporating the block diagram and phasor diagram.

h) The current rating of an Overcurrent relay is 5 A. The relay has a plug setting of 150% and the time setting (TMS) of 0.4. The CT ratio is 400/5. Determine the operating time of the relay for a fault current of 6000 A. At TMS = 1, operating time at various PSM are given in the below table.

PSM	2	4	5	8	10	20
Operating Time (Sec)	10	5	4	3	2.8	2.4

i) With a neat sketch and waveform explain the interruption of capacitive current.

j) With a neat sketch, explain the construction and working principle of a directional or reverse power relay.

k) Define the term 'pilot' with reference to power line protection. List the different types of wire pilot protection schemes and explain for any one of the schemes.

l) Draw the schematic diagram of a numerical relay and explain the functions of various components.

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

Q3 Explain with necessary diagram the principle of operation of a distance protection scheme. How a 3 zone stepped units help to achieve fast discrimination? **(16)**

Q4 Discuss the construction and general principle of operation of a transformer differential protection scheme? Explain percentage biasing of differential relay. **(16)**

Q5 Explain the construction and working principle of SF6 circuit breaker. Discuss the advantages and disadvantages of SF6 circuit breaker. **(16)**

Q6 Describe the construction and working principle of an Induction Cup Type Electromagnetic Relay. Derive the torque equation and discuss its advantages and disadvantages. **(16)**

6ᵗʰ Semester Regular/Back Examination: 2024-25
SUBJECT: Foundation Engineering
BRANCH(S): CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: S081
Answer Question No.1 (Part-I) 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 difference between Rankine's and Coulomb's earth pressure theories?	
b)	List the stability checks for retaining walls.	
c)	What does SPT (N-value) indicate about soil?	
d)	What is the purpose of a strap footing?	
e)	What is the difference between disturbed and undisturbed soil samples?	
f)	Define group efficiency of piles. Comment on group efficiency > 1?	
g)	Distinguish between shallow and deep foundations.	
h)	Define the area ratio.	
i)	Why is subsoil exploration necessary before construction?	
j)	List any two advantages of using test pits for exploration.	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 x 8)**
a)	Discuss the effect of cohesion (*c*) and tension cracks on earth pressure distribution in cohesive soils.	
b)	For a retaining wall with submerged backfill (γ_{sat} = 20 kN/m³, ϕ = 28°), calculate active pressure at 3 m depth if the water table is at 1 m.	
c)	What is the difference between general and local shear failure?	
d)	Explain the concept and construction steps of Culmann's graphical method for determining active earth pressure.	
e)	Describe the procedure of conducting a plate load test, and explain how it is used to determine the settlement and bearing capacity.	
f)	Write a note on Under-reamed pile with neat sketch.	
g)	What are the limitations of Terzaghi's analysis, and how are they addressed in Vesic's bearing capacity equation?	

h) Explain negative skin friction with a sketch.

i) Explain the process of conducting an in-situ vane shear test in soft clays and how the shear strength is determined.

j) Discuss about the various forces acting on a well foundation.

k) Classify the methods of sub-soil exploration and explain wash boring method.

l) Discuss any one geophysical method used in field.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)   (16 x 2)

Q3   A retaining wall 5 m high supports a backfill (cohesion = 20 kN/m^2, angle of internal friction = 10° and bulk unit weight = 20 kN/m^3) with horizontal top. The backfill carries a surcharge of 20 kN/m^2. Compute the total active earth pressure on the wall and its point of application?   **(16)**

Q4 **a)** Explain the IS code method (IS 6403) for computing bearing capacity.   **(8)**

  b) A strip footing is founded at a depth of 1.5 m in sandy soil with γ = 20 kN/m^3 and φ = 35°. Determine the change in ultimate bearing capacity when the water table is:
  (i) at ground level
  (ii) at the base of the footing
  Use appropriate correction factors.   **(8)**

Q5 **a)** Sketch a well foundation and describe the function of each component.   **(8)**

  b) A group of 4 piles (diameter = 0.4 m, length = 10 m) in cohesive soil (cu = 50 kPa) is spaced at 1 m center to center. Compute the block capacity assuming α = 0.9.   **(8)**

Q6   Explain the step-by-step procedure of conducting an SPT. How are corrections applied to N-values?   **(16)**

6th Semester Regular/Back Examination: 2024-25
SUBJECT: HYDROLOGY & IRRIGATION ENGINEERING
BRANCH(S): CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: S173
Answer Question No.1 (Part-I) 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) Name the type of data recorded by a tipping-bucket rain gauge. How does it differ from a weighing-bucket rain gauge?

b) Classify streams based on flow characteristics and give one example of each type.

c) List any three physical or climatic factors influencing the shape of a hydrograph.

d) What do you mean by basin lag? How does it affect flood response?

e) Define intensity of irrigation. How is it related to GCA and CCA?

f) What is the purpose of plotting a flow net in seepage analysis?

g) Give two key design differences between a high dam and a low dam.

h) Why is a divide wall important in diversion headworks? Mention any one function.

i) How does a drainage gallery improve the safety of a gravity dam?

j) Mention the formula linking duty, delta, and base period. List one factor affecting duty.

Part-II

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

a) Describe the hydrologic cycle with a neat sketch. Mention any three key processes involved.

b) What is a runoff hydrograph? Discuss the influence of catchment characteristics and rainfall duration on its shape.

c) Explain the concept of design flood and probable maximum flood. Where are these used in hydraulic engineering?

d) Compare and contrast Bligh's creep theory and Khosla's theory in designing safe hydraulic structures.

e) Define the phi-index. How is it useful in separating rainfall excess from total rainfall? Illustrate with a basic example.

f) Draw the layout of diversion headworks and explain the role of each component in sediment control and flow division.

g) List different types of earthen dams. On what basis is a preliminary dam section chosen for a given site condition?

h) Differentiate between water conveyance efficiency and water distribution efficiency. How do they affect irrigation performance?

i) State Horton's infiltration equation. Describe how a double-ring infiltrometer is used to determine infiltration rate.

j) Describe any two types of canal falls with neat sketches. What are their functional differences?

k) Discuss how a mass curve is used in estimating reservoir storage capacity. Show with a sketch and explanation.

l) A storm over a 450 ha watershed resulted in 0.37 Mm³ of direct runoff. Using a rainfall mass curve, outline steps to calculate the φ-index and excess rainfall duration.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)　　　　　　　　**(16 x 2)**

Q3 **(a)** Determine the best values of the parameters of Horton's infiltration capacity equation for the following data on soil infiltration tests using a double-ring Infiltrometer.　　**(8)**

Time since start (minutes)	5	10	15	25	40	60	75	90	110	130
Cumulative Infiltration (mm)	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0

(b) Explain the process of estimating evaporation losses from large water bodies. Discuss any one method, such as the Penman-Monteith method, in detail, highlighting its advantages and limitations.　　**(8)**

Q4 **(a)** After how many days a crop will be required to supply water to have sufficient irrigation with the following data: The field capacity of the soil = 34%, Permanent wilting point = 15%, Dry unit weight of soil = 11 kN/m³, Effective depth of root zone = 850 cm, Daily consumption of water for the given crop = 14 mm.　　**(8)**

(b) Explain the cost-benefit analysis carried out in justifying the lining of the canal.　　**(8)**

Q5 **(a)** Design a triangular concrete-lined channel to carry a discharge of 20 cumecs at a slope of 10 cm/km. The side slope of the channel is 1.25:1. Consider Manning's roughness coefficient (n) is 0.03.　　**(8)**

(b) With the help of a labeled diagram, explain different types of cross-drainage works. Discuss how the selection of a particular type depends on topography and discharge conditions.　　**(8)**

Q6 Draw the elementary profile of a gravity dam and explain various forces acting on it. A 100 m height concrete gravity dam trapezoidal in cross-section has upstream face vertical, crest width 6 m, base width 75 m and free board equal to 4 m. Calculate the maximum principal stress at the toe when the reservoir is full. Take unit weight of concrete as 23.5 KN/m³. Consider only self-weight, hydrostatic water pressure, uplift pressure. There is no drainage gallery and tail water.　　**(16)**

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Machining Science and Technology
BRANCH(S): Mechanical Engineering
Time: 3 Hours
Max Marks: 100
Q.Code: S208
Answer Question No.1 (Part-I) 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 pure orthogonal turning?
b) Show all the tool signature of ORS system.
c) How Surface Roughness is measured?
d) What are the types of wears formed during a turning process?
e) What is Degree of Freedom (DOF)? What is its value in taper turning?
f) State suitable machining parameters for forming brittle chips.
g) Explain Faraday's two laws.
h) State two machining processes where quick return mechanism is used.
i) A hole is to be made on a ceramic plate. What are the machining processes used?
j) Define LASER.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**
a) A steel rod is turned in a lathe by a tool of geometry –6°, 5°, 6°, 7°, 10°, 75°, 1.2 mm. Show all the angles in proper planes in ASA system.
b) Show the terms Ra, Rz, Rmax., Waviness of a surface roughness measurement system.
c) Show the possible speed transmission mechanism from motor to spindle of a lathe.
d) The value of tool life decreased from 160 minutes to 40 minutes due to increase in cutting velocity from 160 m/min. to 320 m/min. in turning low carbon steel. Find the constant and index.
e) Show the Merchant circle diagram with all the forces and angles.
f) Compare the appropriate Flank Wear, Crater Wear for machining of medium carbon steel with a Velocity of 200 m/min., feed 0.5 mm/rev. and depth of cut 0.5 mm after machining for 2 minutes, 5 minutes respectively for a length of 400 mm.
g) Show the velocity vector diagram among (Cutting Velocity) Vc, (Feed Velocity) Vf, and (Shear Velocity) Vs.
h) Show a complete set of fixture and jig with drawings for a milling operation.

i) What are the basic differences among Conventional, Semi-automatic, and Automatic lathe?

j) State Machinability and Economics of Machining with few examples.

k) What are the types of pulse generated in an EDM process? Show with neat sketches.

l) Show all the parts of an LBM process.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)   (16 x 2)

Q3   Show all the angles of an ORS and ASA systems. Compare with drawings.   **(16)**

Q4   Compare Gear Milling and Gear Hobbing process by sketches.   **(16)**

Q5   Define ECM and EDM process and compare all the features with suitable sketches.   **(16)**

Q6   How materials are removed by an AJM and USM processes? Compare the advantages and disadvantages with sketches.   **(16)**

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Microprocessors and Microcontrollers
BRANCH(S): EEE, ELECTRICAL
Time: 3 Hours
Max Marks: 100
Q.Code: S087
Answer Question No.1 (Part-I) 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 significance of the clock in a microprocessor?
  b) What is instruction pointer and what is its significance in a microprocessor?
  c) What is bus cycle in 8086? In a 5 MHz 8086 system what is the duration of bus cycle?
  d) How many instruction types are supported by 8086 microprocessor? Mention at least two types.
  e) What is the role of PPI 8255 in a microprocessor system?
  f) How many ways the keyboard can be interfaced with the processor?
  g) The internal data memory of 8051 is divided in to how many groups? Mention the groups.
  h) How many SFR are in 8051 microcontroller? Specify the address range.
  i) Mention the modes of operation of 80386 processor.
  j) 8279 keyboard and display interface can support how many maximum keys and how many digits of display?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**
  a) Describe and explain the internal architecture of 8086 Microprocessor with neat diagram.
  b) Compare the 8086 and 80486 microprocessors for their major features.
  c) Explain in brief about the structure of 8086 interrupt vector table with neat sketch.
  d) Write in brief the various registers present in 8051 microcontroller.
  e) Write an 8086 assembly language programme to sort an array of ten bytes in ascending order. Mention clearly the comments to your Program.
  f) Describe the different modes of operation of timers/counters in 8051 with its associated register.
  g) Mention the control word format of 8255 and explain how each bit is programmed.
  h) Mention the maskable and non-maskable interrupts available in 8086.

i) Briefly explain the concept of pipelining in 8086 and discuss its advantages and disadvantages.

j) Using an 8-bit microprocessor design interface an 8K × 8 EPROM and 8K × 8 RAM.

k) Distinguish between memory mapped I/O and peripheral I/O.

l) Explain how interrupts are prioritized in 8051 controller.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)   **(16 x 2)**

Q3   With suitable diagram explain the DAC interfacing with 8051 microcontroller.   **(16)**

Q4   Explain the signals in interfacing the bus controller with 8086 microprocessor in maximum mode operation.   **(16)**

Q5   Explain with neat diagram for 7 segment LED interface with a 16 bit microprocessor.   **(16)**

Q6   Draw the schematic for interfacing a dc motor with 8051 microcontroller and write 8051 ALP for servo motor control.   **(16)**

6th Semester Reg/Back Examination: 2024-25
Numerical Methods
CSE, CSEAIML,CSEAI
Time : 3 Hour
Max Marks : 100
Q. Code : S210
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 rate of convergence? Find rate of convergence of Secant method

b)   Find relative error and percentage error if 0.8333 is approximated to $\frac{5}{6}$.

c)   Write the error term in Simpson's 1/3rd rule .

d)   Given $y' = xy$ with $y(0) = 1$ find $y(0.4)$ using Euler's method .

e)   Find the divided difference $f[x_1, x_2, x_3]$ if $f(x) = \dfrac{1}{x^3}$

f)   Find the interval in which the smallest positive root of the equation
      $x^3 + 4x^2 - 10 = 0$ lies.

g)   Write the Newton-Cotes quadrature integration formula.

h)   Differentiate between interpolation and extrapolation ?

i)   What do you mean by Spline Interpolation ?

j)   Find the geometrical interpretation of Trapezoidal rule for numerical integration .

Part-II

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

a)   Find the root of the equation $x^3 + 4x^2 - 10 = 0$ using Bisection method.

b)   Find a cubic polynomial from the following table using Newton's divided
      difference formula:

x	0	1	2	5
y	2	3	12	147

c)   Evaluate $\int_0^5 \frac{dx}{4x+5}$ using Simpson's 1/3rd rule by dividing the range into 10 equal

      parts .

d) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using three point Gaussian quadrature formula.

e) Find the solution of the below system of equations correct to three decimal places, using the Gauss-Seidel iteration method

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

f) Solve $y' = 1 - y, y(0) = 1$ using Euler's method. Find y at $x = 0.1$ and $x = 0.2$
Compare the results with results of exact solution

g) Use Lagrange interpolation formula to evaluate y(5) for the following data sets:

x	3	7	9	10
y	168	120	72	63

h)
Find the smallest eigenvalue in magnitude of the matrix $A = \begin{pmatrix} 4 & 6 & 8 \\ 6 & 7 & 30 \\ 8 & 30 & 50 \end{pmatrix}$ using 4

iterations of the inverse power method

i) Use Newton-Raphson method to approximately the root of the equation
$x^3 - 8x - 4 = 0$ lying in the interval [3,4] and use $x_0 = 3.5$

j) Define truncation error, absolute error. Explain the loss of significant digits with a suitable example

k)
Solve the system of equations $Ax = b$ where $A = \begin{bmatrix} 2 & 1 & 1 & -2 \\ 4 & 0 & 2 & 1 \\ 3 & 2 & 2 & 0 \\ 1 & 3 & 2 & -1 \end{bmatrix}$. $b = \begin{bmatrix} -10 \\ 8 \\ 7 \\ -5 \end{bmatrix}$.

Using the LU decomposition method. Take all the diagonal elements of L as 1

l) Find tan (0.13) using following data points :

x	0.10	0.15	0.20	0.25	0.30
$y = \tan x$	0.1003	0.1511	0.2027	0.2553	0.3093

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

Q3   Find real root of the equation $2x = \cos x + 3$ by fixed point iteration method .   **(16)**

Q4   Apply R-K method of 4th order to find approximate value of y at   **(16)**

$x = 0.1 \text{ to five significant figure },\text{where} \frac{dy}{dx} = x^2 + y, y(0) = 0.94$

Q5   Using Adam's Bashforth method find $y(4.4)$ given that   **(16)**

$\frac{dy}{dx} = \frac{2-y^2}{5x} , y(4) = 1, y(4.1) = 1.009, y(4.2) = 1.0097 , y(4.3) = 1.0143$

Q6   Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's method and hence find the approximate value of π **(16)**

Registration No :

Part-I

Q1   Answer the following questions :   (2 x 10)

a) Define convex set.

b) Write the basic difference between slack variable and artificial variable.

c) How to identify degenerate solution in a transportation problem?

d) What is golden ratio?

e) Optimal feasible solution of a non-linear programming problem always attains at the corner point of the feasible space. True or False? Justify.

f) Lagrange multiplier method is used to find <u>local / global</u> optimum value of a NLP. Find the correct one with justification.

g) Find the criteria that KKT condition becomes sufficient for a Nonlinear programming problem.

h) Define M/M/S model.

i) What is balking in queueing theory?

j) Write an application of optimization techniques in engineering.

Part-II

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

a) Solve using graphical method: $Max\ Z = 5x + 2y$ subject to $x + y \geq 5$, $x - y \leq 5, x, y \geq 0$.

b) Solve using simplex method, $Max\ Z = x + y$ subject to $25x + 15y \leq 250, 20x + 10y \leq 175, x, y \geq 0$.

c) Solve using Big-M method, $Max\ Z = 3x + 2y$ subject to $2x + y \leq 2, 3x + 4y \geq 12, x, y \geq 0$.

d) Write a short note on sensitivity analysis.

e) State strong duality theorem. Find the dual of the given LPP: $Max\ Z = $x+3y$ subject to $x + y \leq 3, 2x - y \geq 9, x + 3y = 7, x \geq 0,\ y$ is

unrestricted.

f) Solve by dual simplex method, $Max\ Z = -3x - y$ subject to $-x - y \le -1$, $-2x - 3y \le -2$, x, y$\ge$ 0.

g) Solve the integer programming problem $\boldsymbol{Max\ Z = x + y}$ subject to $\boldsymbol{3x + 2y \le 12}$, $\boldsymbol{y \le 2}$, $\boldsymbol{x, y}$ are integers $\boldsymbol{\ge 0}$.

h) A company has four workers and four jobs to be completed. Each worker must be assigned to complete one job. The time required to finish each job by individual worker is shown in the table below. Company wants to minimize the total time needed to complete the four jobs. Find the optimal assignment.

Jobs	A	B	C	D
Worker 1	5	3	2	8
Worker 2	7	9	2	6
Worker 3	6	4	5	7
Worker 4	5	7	7	8

i) Find minimum value of $F(x,y,z) = x^2 + y^2 + z^2$ subject to $2x + y + z = 9$ and $5x + 5y + 7z = 29$.

j) Solve Min $f(x,y) = 2x + y$ subject to $x^2 + y^2 \le 4$, $x \le y$.

k) Using Golden section search find the value of x that minimizes $f(x) = x^4 - 14x^3 + 60x^2 - 70x$ in the interval $[0,2]$. Locate the value of x lies within the interval of length 0.3.

l) Arrivals to an airport with a single runway are Poisson distributed with a rate of 25 per hour. The average time to land an aircraft is 80 seconds and this time is exponentially distributed. Find the utilization of the runway, average waiting time in the system and average length of the system.

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

Q3
a) Find the size of interval containing the minimizer after sixth iteration using Fibonacci search for the problem Min $f(x) = x^2 - sin\ x$ with initial interval [0,1].   **(8+8)**

b) One manufacturing company manufactures two products A and B. Both the products are processed on two machines M and N. The data provided as follows:

	$Hours$ per	$Required$ unit	$Profit\ per\ unit$
Products	M	N	5
A	1	3	30
B	2	2	20
$capacity\ per\ week\ (hours)$	80	120	

Find out how many units of A and B should be produced per week in order to maximize the profit?

Q4   Minimize the transportation cost for the problem given below using MODI   **(16)**
method

	D_1	D_2	D_3	D_4	supply
O_1	6	3	5	4	22
O_2	5	9	2	7	15
O_3	5	7	8	6	9
Demand	7	12	17	9	

Q5   Solve the quadratic problem Max $f(x,y) = -2x^2 - 2y^2 - 2xy + 4x + 6y$ **(16)**
subject to $x + 2y \leq 2,\ x, y \geq 0$.

Q6   Consider an M/M/1 queueing system in which expected waiting time and   **(14+2)**
expected number of customers in the system are one minute and 10
customers, respectively. Determine the probability that a customer's
service time exceeds 10 seconds. Find traffic intensity of M/M/5 model.

Registration No.:

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Power System Operation and Control
BRANCH(S): EEE, ELECTRICAL, EE
Time: 3 Hours
Max Marks: 100
Q.Code: S130
Answer Question No.1 (Part-I) 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 per-unit inertia constant of an alternator.
   b)   Define "load factor"?
   c)   Write the equality and inequality constraints for solving the economic load dispatch problem.
   d)   What are the different types of buses used for the load flow studies?
   e)   A power system network consists of 3 elements 0-1, 1-2, and 2-0 of impedances 0.2, 0.4 & 0.5, respectively. What is its bus impedance matrix?
   f)   Obtain the expression of the governor model in a single area control, showing the input-output relation.
   g)   What are Synchronizing Power Coefficients?
   h)   What is the significance of the Jacobian matrix in load-flow analysis?
   i)   What are the methods used for Power factor correction?
   j)   The PU value of impedance is 0.8 at base values of 400 MVA and 11 kv. Find the new PU values if the base values changed to 4400MVA and 33 kv.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)
   a)   A power system has impedances between various buses
            Bus 1 - reference j2Ω, bus 2 - reference j2Ω, bus 3 - reference j2Ω
            Bus 1 to bus 3 j0.2Ω , 2 - 3 j0.4Ω ,1 - 4 j0.4Ω , 2 - 4 j0.4Ω , 3 - 4 j0.4Ω
            Draw the configuration of the system and find the bus admittance matrix.
   b)   Explain unit commitment.
   c)   Compare the Gauss-Seidel load flow method with the Newton-Raphson method.
   d)   Derive the power angle equation for a synchronous generator and an infinite bus connected through a transmission line.
   e)   An incomplete nodal admittance matrix for a 4-bus system with negligible charging admittance is given below. Find the missing terms.

$$\begin{pmatrix} 0.7-j3 & -0.2+j1 & -0.5+j2 & Y_{14} \\ Y_{21} & Y_{22} & -0.3+j2 & -0.5+j3 \\ Y_{31} & Y_{32} & Y_{33} & -1+j4 \\ Y_{41} & Y_{42} & Y_{43} & Y_{44} \end{pmatrix}$$

f) The fuel inputs per hour of plants 1 and 2 are given as

$F_1 = 0.2P_1^2 + 40P_1 + 120$ Rs/hr

$F_2 = 0.25P_2^2 + 30P_2 + 150$ Rs/hr

Determine the economic operating schedule and the corresponding cost of generation. If the maximum and minimum loading on each unit is 25 MW and the demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the unity. Determine the saving obtained by loading the units as per equal IPC?

g) Derive the expressions of critical clearing angle and critical clearing time.

h) What is a regulating transformer? What will be the change in the Ybus when a regulating transformer is present?

i) Derive the penalty factor in economic load dispatch problem?

j) A power system has a total load of 1260 MW at 60 Hz. The load varies by 1.5% for every 1% change in freq (D = 1.5). Find the steady-state frequency deviation when a 60 MW load is suddenly tripped, if I) There is no speed control.

II) The system has 240MW of spinning reserve evenly spread among 500 MW of generation capacity with 5% regulation based on this capacity. All other generations are operating with values wide open. Assume that the effect of governing dead bands is such that only 80% of the governor responds to the reduction in system load.

k) What is transient stability? How to improve transient stability of a power system?

l) Two thermal generating units are operating in parallel at 60 Hz to supply a total load of 700 MW. Unit 1, with a rated output of 600 MW and 4% speed drop characteristics, supplies 400 MW, and Unit 2, which has a rated output of 500 MW and 5% speed drop, supplies the remaining 300 MW of load. If the total load increases to 800 MW, determine the new loading of each unit and the common frequency change before any supplementary control action occurs. Neglect losses

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) (16 x 2)

Q3 A two bus system is shown in following figure. If 100 MW is transmitted from plant 1 to the load; a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when the system λ is Rs. 25 /MWh. The incremental fuel costs of the two plants are : **(16)**

$\frac{dF_1}{dP_1} = 0.02P_1 + 16$

$\frac{dF_2}{dP_2} = 0.04P_2 + 20$

Q4 What do you mean by load frequency control? Describe ALFC with block diagram. **(16)**

Q5 Derive the critical clearing angle for the fault that occurs at the busbar of the generator in a parallel transmission Line. **(16)**

Q6 Derive the swing equation of the rotor. Derive the condition of stability after following a disturbance. **(16)**

6th Semester Reg/Back Examination: 2024-25
SUBJECT: Real Time System
BRANCH(S): CSE, CSEAI, IT
Time: 3 Hour
Max Marks: 100
Q. Code: S179

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 static and dynamic task scheduling in real-time system.
  b) What is a real-time clock, and how does it contribute to RTOS functioning?
  c) Define interrupt latency and its impact on real-time performance
  d) Explain the role of task states in an RTOS scheduler (e.g., Ready, Running, Blocked).
  e) What is priority inversion? Provide one real-world example where it may occur.
  f) How do semaphores prevent race conditions?
  g) Define temporal consistency in real-time databases.
  h) Why are watchdog timers critical in safety-critical real-time systems?
  i) What is the main scheduling challenge when using backup overloading?
  j) Differentiate between transient and permanent faults with examples.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 × 8)
  a) What are the defining characteristics of a real-time system? Discuss the Rate Monotonic Algorithm
         (RMA). Figure out the issues associated with this algorithm.
  b) A real-time system handles four tasks with the following parameters: Draw the Gantt chart for Earliest
         Deadline First (EDF) scheduling. Determine if all tasks meet their deadlines.

Task	Arrival Time (ms)	Execution Time (ms)	Deadline (ms)
A	0	3	7
B	1	2	5
C	2	1	3
D	3	2	6

  c) Explain how interrupt handling is managed in a real-time operating system.
         Discuss interrupt latency, context switching, and nested interrupts. Give a diagrammatic view.
  d) Describe inter-process communication (IPC) mechanisms used in real-time systems. Include
         message queues, semaphores, and shared memory with examples.
  e) Discuss and compare the following concurrency control protocols used in real-time databases:
         i. Priority Inheritance Protocol (PIP). ii. Priority Ceiling Protocol (PCP).
  f) Explain how task synchronization is achieved using semaphores and event-flags. Include practical
         scenarios where each method is appropriate.
  g) Describe the architectural modifications and features introduced in UNIX-based RTOS variants (e.g.,
         RTLinux) to support real-time capabilities.

h) Discuss different types of priority inversion under Priority Ceiling Protocol (PCP).

i) Explain how the overloading of backup tasks works without compromising fault isolation. What are the criteria for scheduling backups on the same processor.

j) Explain with an example how a real-time task can be implemented and scheduled in a POSIX-compliant UNIX system using real-time APIs.

k) Explain the challenges involved in scheduling real-time tasks in a distributed system. Consider network latency, clock synchronization, task migration, and fault tolerance.

l) Describe and compare the following scheduling strategies used in distributed real-time systems: (i). Static vs. Dynamic Scheduling (ii). Centralized vs. Distributed Scheduling

Part-III

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

Q3 A real-time system has three periodic tasks that are to be scheduled using a clock-driven scheduler. Their parameters are as follows: **(16)**

Task	Period (ms)	Execution Time (ms)	Offset (ms)
T1	4	1	0
T2	6	2	0
T3	12	3	0

Assumptions are: (i) All tasks are ready to execute at their offsets, Preemption is allowed, (ii) the schedule is to be built for the least common multiple (LCM) of the periods, i.e., hyperperiod, (iii) the system tick is 1 ms.

Questions: a) Compute the hyperperiod of the system. (b) Construct a static time schedule showing task execution over the hyperperiod using a Gantt chart. (c) Comment on the CPU utilization and any idle time in the schedule. (d) Discuss advantages and limitations of using clock-driven scheduling for this task set.

Q4 Describe how conflict resolution and deadlock prevention are handled in real-time concurrency control. (i) How are missed deadlines handled? (ii) What role does transaction abort/restart play in RTDB systems? **(16)**

Q5 Given the following set of transactions, analyze which protocol (PIP or PCP) would be more appropriate, and justify your reasoning: **(16)**

Transaction	Start Time (ms)	Execution Time (ms)	Deadline (ms)	Data Item Accessed	Priority
T1	0	5	20	X (Read)	High
T2	1	4	15	X (Write)	Medium
T3	2	6	30	Y (Read)	Low

Assume resource locking is required and preemption is allowed. Draw a Gantt chart showing transaction execution and blocking under your chosen protocol.

Q6 Writ short notes on following **(16)**
a) Memory management in RTOS
b) Interrupt handling in RTOS
c) Real-time clock and its importance
d) Real-time communication over packet switched network

Total Number of Pages: 02
Course: B.Tech
Sub_Code: RME6D001

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Smart and Composite Materials
BRANCH(S): MECH, MMEAM
Time: 3 Hours
Max Marks: 100
Q.Code: S180
Answer Question No.1 (Part-I) 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 are composites classified?
   b) Give any four examples of naturally found composites.
   c) Name two each of synthetic organic and inorganic fibers.
   d) What is metal matrix composites?
   e) What is rheocasting?
   f) What is autoclave moulding?
   g) What is sol-gel processing of ceramic matrix composites?
   h) Name two practical uses of honey comb structure.
   i) The weight fraction of glass in a glass/epoxy composite is 0.8. If the specific gravity of glass and epoxy is 2.5 and 1.2 respectively, find the fiber and matrix volume fractions.
   j) State the reasons of using short fiber composites.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**
   a) What are the factors that determine the properties of composite materials? Explain.
   b) Write the number of independent elastic constants for three-dimensional anisotropic, monoclinic, orthotropic, transversely isotropic, and isotropic materials.
   c) Discuss the melt stirring liquid state processing of metal matrix composites.
   d) Give the advantages and drawbacks of metal matrix composites over polymer matrix composites.
   e) Give names of various fibers used in advanced polymer composites. Give a description of the carbon fiber.
   f) With neat sketch, elaborate the sol-gel processing of ceramic matrix composite.
   g) Differentiate between cold pressing and sintering process of ceramic matrix composite.
   h) Briefly discuss the damping characteristics of polymer matrix composites.

i) Polymers are classified as thermosets and thermoplastics. Briefly discuss about the difference between the two.

j) A balanced orthotropic, or square symmetric lamina, is made up of 0° and 90° fibers woven into a fabric and bonded together. Describe the stress - strain relationships for such a lamina in terms of the appropriate engineering constants.

k) Classify the following laminates:
1. [−30/45/−45/−30]
2. [−30/30/−30/30]
3. [30/−30/30]
4. [45/30/−30/−45]

l) A carbon/epoxy composite specimen has dimensions of 2.54 cm × 2.54 cm × 0.3 cm and a weight of 2.98 gm. After "resin digestion" in an acid solution, the remaining carbon fibers weigh 1.863 gm. From independent tests, the densities of the carbon fibers and epoxy matrix materials are found to be 1.9 and 1.2 gm/cm^3, respectively. Determine the volume fractions of fibers, epoxy matrix, and voids in the specimen.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)   **(16 x 2)**

Q3   Explain with neat sketches, liquid state processing of metal matrix composites.   **(16)**

Q4   Discuss the processing, properties and applications of SiC whisker reinforced ceramic matrix composites.   **(16)**

Q5   Name various manufacturing methods of polymer matrix composites. With neat sketch, elaborate the spray-up technique for manufacturing of polymer matrix composites.   **(16)**

Q6   Write short note on the followings: **(4 x 4)**
a) Interfacial bonding
b) Chemical vapour deposition (CVD) technique
c) Liquid infiltration
d) Recycling of polymer matrix composites (PMCs)

6th Semester Reg/Back Examination: 2024-25
Software Engineering
BRANCH(S): CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ELECTRICAL & C.E, ELECTRONICS & C.E, IT
Time : 3 Hour
Max Marks : 100
Q. Code : S040
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 software crisis and mention its key causes.
b) Explain the difference between functional and non-functional requirements.
c) What is the role of abstraction in software development?
d) What is software reuse, and why is it beneficial?
e) Define Cyclomatic Complexity.
f) What are Decision tables and trees in software requirements engineering?
g) Explain software reverse engineering briefly.
h) Define cohesion and coupling in software design.
i) What are the essential guidelines of IEEE 830 for software requirement specification (SRS)?
j) What is the significance of modularity in software engineering?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 × 8)
a) Compare the classical waterfall model and the spiral model, highlighting their advantages and limitations.
b) Describe the prototyping model and state situations where this model is appropriate.
c) Discuss Agile methodologies, specifically Extreme Programming and Scrum.
d) Explain structured analysis using Data Flow Diagrams (DFDs).
e) Detail the steps involved in software requirement gathering and analysis.
f) Differentiate between high-level and detailed design with suitable examples.
g) Explain the concept and importance of User Interface Design in software engineering.
h) Discuss white-box and black-box testing techniques with examples.
i) Discuss Client-Server software engineering along with its merits and demerits.
j) Describe the characteristics and goals of software maintenance.
k) Outline the concept of software quality and discuss SEI CMM briefly.
l) Explain software reengineering. How does it differ from reverse engineering?

Part-III

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

Q3 Explain in detail the various software process models highlighting their applicability, strengths, and weaknesses. Provide real-world examples to justify your points. **(16)**

Q4 Explain in depth various software testing methods including Unit Testing, Integration Testing, System Testing, and discuss how each contributes to software reliability and quality assurance. **(16)**

Q5 Discuss software reliability thoroughly, including concepts, measurement methods, and reliability growth modeling. Explain how reliability impacts the overall software lifecycle. **(16)**

Q6 Elaborate on emerging topics in software engineering such as Service-oriented Architecture (SOA) and Software as a Service (SaaS). Discuss their relevance, implementation challenges, and potential future directions. **(16)**