

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: B.Tech
Sub_Code: REC5C003

6th Semester Back Examination: 2025-26
SUBJECT: Microprocessor and Micro Controllers
BRANCH(S): EEE, ELECTRICAL
Time: 3 Hours
Max Marks: 100
Q.Code: V107

Answer Q1 (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 role of ALU in a microprocessor?
- b) Differentiate between computer organization and architecture.
- c) What is the significance of 8 bit in an 8-bit microprocessor?
- d) What is Pipelining in the context of the 8086?
- e) Differentiate between MUL and IMUL instructions.
- f) Why Port C of 8255 PPI is different from other ports?
- g) What is "Key Debouncing" in reference to 8279?
- h) What is the bit size of the Program Counter (PC) in 8051 microcontroller and what is its role?
- i) Explain the function of IO/M signals in 8-bit processor architecture?
- j) Can we use 8255 PPI in ADC/DAC interfacing? Justify your answer.

Part-II

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

- a) Explain the Internal Architecture of the 16-bit 8086 Microprocessor.
- b) How many interrupts are available in 8086? Mention the predefined software interrupts available in 8086.
- c) Explain the concept of segmented memory and what are its advantages?
- d) Draw and explain the timing diagram for opcode fetch operation for an 8-bit microprocessor.
- e) With suitable diagram explain major components of 8279.
- f) Write an ALP to Find the Largest/Smallest Number in an Array for 8051 MCU.
- g) Write a brief note on I/O port configuration in 8051.
- h) Explain the key architectural features of the 80386 processor.
- i) With suitable diagram explain the ADC interfacing with 8051 microcontrollers.
- j) Discuss the various addressing modes of 8086.
- k) How is the physical address calculated in 8086? Give an example.
- l) With suitable schematics explain the ADC interfacing with 8086 microprocessors.

Part-III

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

- Q3** Draw the pin details of 8051 microcontroller and explain the purpose of each pin. (16)
- Q4** Why is DAC required? How A/D converter interfaced with 8086? Give suitable diagram. (16)
- Q5** With the help of timing diagram, explain the Read and Write cycle in maximum mode operation of the 8086 microprocessors. (16)
- Q6** Explain the basic organization of a computer system with a neat block diagram. Discuss the role of CPU, memory, and I/O devices in detail. (16)

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCS5D002

6th Semester Back Examination: 2025-26

SUBJECT: Artificial Intelligence and Machine Learning

BRANCH(S): AEIE, C&EE, CIVIL, ECE, EEE, EIE, ELECTRICAL, ETC, MECH

Time: 3 Hours

Max Marks: 100

Q.Code: V336

Answer Q1 (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)

- What is a state space?
- Define agent function.
- What is a fully observable environment?
- What is the purpose of pruning in game trees?
- What is cut-off depth?
- What is a quantifier? Name its types.
- What is likelihood in Bayesian inference?
- What is probabilistic reasoning?
- Define rote learning.
- What is genetic learning (genetic algorithms)?

Part-II

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

- Explain heuristic functions and their role in search.
- Compare Greedy Best-First Search and A* search.
- Explain the structure of an intelligent agent with a neat diagram.
- Compare forward chaining and backward chaining.
- Describe knowledge engineering in First-Order Logic.
- What is lifting in FOL inference? Explain its importance.
- Explain approximate inference techniques in Bayesian Networks.
- Differentiate between joint, marginal, and conditional probabilities.
- Compare exact and approximate inference.
- Differentiate between learning with complete data and hidden variables.
- Describe the architecture of neural networks.
- Explain the process of knowledge acquisition in expert systems.

Part-III

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

- Q3** Describe Constraint Satisfaction Problems (CSP) in detail. Explain: (i) Components (variables, domains, constraints), (ii) Methods for solving CSP (16)
- Q4** Explain Alpha-Beta pruning with an example. Show how it reduces the number of nodes evaluated compared to Mini-Max. (16)
- Q5** Describe how Bayesian Networks represent knowledge in uncertain domains. Discuss advantages over full joint distributions. (16)
- Q6** Describe Explanation-Based Learning (EBL) in detail. Illustrate with a suitable example and discuss its advantages. (16)

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCS6C002

6th Semester Back Examination: 2025-26
SUBJECT: Compiler Design
BRANCH(S): CSE, CSEAIML, CSEDS, CST
Time: 3 Hours
Max Marks: 100
Q.Code: V093

Answer Q1 (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)

- Differentiate between deterministic finite automata (DFA) and non-deterministic finite automata (NFA) in the context of lexical analysis.
- Define a regular grammar and state its significance in compiler design.
- What is handle pruning in bottom-up parsing?
- Represent the expression $x = y + z * t$ using Triplets in intermediate code generation.
- State the primary purpose of Back Patching during compilation.
- Define a basic block and state its role in code generation.
- List two common techniques used in Peephole Optimization.
- What is an activation record in a run time environment?
- Distinguish between inherited and synthesized attributes in Syntax Directed Translation.
- Mention any two symbol attributes stored in a symbol table.

Part-II

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

- Construct an NFA for the regular expression $(a | b) * abb$ and convert it to its equivalent DFA to demonstrate the design of a Lexical Analyzer.
- Explain the concept of Recursive descent parsing. Why does left recursion cause issues in this parser, and how is it resolved?
- Discuss the construction of efficient LALR parsing tables. How does it resolve state explosion compared to LR(1) parsers?
- Construct a Directed Acyclic Graph (DAG) for the arithmetic expression $a + a * (b - c) + (b - c) * d$ and explain its nodes.
- Explain the translation of Boolean expressions and control flow statements into three-address codes using an appropriate example.
- Outline the process of Type checking and Conversions during the intermediate code generation phase.
- Identify and analyze the key factors involved in the design of a code generator.
- Explain the concepts of elimination of local common sub-expressions and redundant codes with suitable code snippets.

- i) Describe simple code generation using flow graphs. How do flow of control optimization techniques improve the generated target code?
- j) Compare Static Storage Allocation with Dynamic Storage Allocation in the context of run time storage organizations.
- k) Construct a dependency graph for evaluating semantic rules using a Syntax Directed Definition (SDD) for a simple desk calculator.
- l) Explain the internal structure and features of symbol tables. How does it manage different scopes during compilation?

Part-III

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

- Q3 a)** Write the algorithm for computing FIRST() and FOLLOW() of non-terminals in a grammar. Compute FIRST() and FOLLOW() of non-terminals for the following grammar. **(8 + 8)**
- $S \rightarrow aBDh$
 $B \rightarrow cC$
 $C \rightarrow bC \mid \epsilon$
 $D \rightarrow EF$
 $E \rightarrow g \mid \epsilon$
 $F \rightarrow f \mid \epsilon$
- Find the predictive parsing table for the above grammar.
- b)** Construct an SLR parsing table for the following grammar:
 $R \rightarrow R + R \mid RR \mid R^* \mid (R) \mid a \mid b$
 Resolve the parsing action conflicts in such a way that regular expression will be parsed normally. Consider the left associativity for all operators and operator precedence are as follows
 $() > * > concatenation > +$
- Q4 a)** Design the intermediate code generation logic for an array reference translation mapping a 2D array $A[i, j]$ to its target address. **(8 + 8)**
- b)** Formulate the three-address code (using Quadruples) for the following code block, clearly demonstrating the application of Back Patching for the conditional jumps:
- ```

while (A < B) {
 if (C == D)
 X = Y + Z;
 else
 X = Y - Z;
}

```
- Q5** You are tasked with optimizing intermediate code for an embedded system. **(8 + 8)**
- a) Given a sequence of un-optimized three-address codes, design a methodology to partition them into basic blocks and construct a flow graph.
  - b) Formulate a strategy using simple code generation combined with STACK allocation and register allocation to minimize memory footprints while executing the flow graph.
- Q6 a)** Design the structure of an activation record and evaluate the handling of activation records for calling sequences during the execution of a deeply recursive function (e.g., Quick Sort). **(8 + 8)**
- b)** What is the job of symbol table? What is  $l$ -value and  $r$ -value in symbol table? Name the entries in the symbol table. How to store names in symbol table.

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RME6C001

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Design of Machine Elements

BRANCH(S): MECH, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: V043

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)

- Define factor of safety.
- State Rankine theory of failure and its limitations.
- What are the methods used to improve fatigue strength?
- Define stress concentration and stress concentration factor.
- What is interchangeable manufacture?
- What are the factors to be considered in shaft design?
- What is a flexible coupling?
- State two advantages of ball bearings.
- Differentiate between ball bearing and roller bearing
- What is nipping of leaf spring?

Part-II

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

(6 x 8)

- State the following theories of failure and their use
  - Maximum principal stress theory of failure
  - Maximum shear stress theory of failure
- Briefly discuss on different stages of design.
- A shaft transmits 20 kW power at 200 rpm. Ultimate shear stress = 360 MPa, factor of safety = 8. If a hollow shaft is used with  $d_i/d_o = 0.5$ , find: (1) Diameter of solid shaft (2) Internal and external diameter of hollow shaft.
- Design a cotter joint for the transmission of 20 kN tensile or compressive load. Allowable stresses for all the components may be taken as  $\sigma_{at} = 50 \text{ N/mm}^2$ ,  $\sigma_{acr} = 80 \text{ N/mm}^2$  and  $\tau_a = 40 \text{ N/mm}^2$ .
- 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  $\sigma_t = 120 \text{ MPa}$ ;  $\tau = 100 \text{ MPa}$ ; and  $\sigma_c = 150 \text{ MPa}$ . Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.
- What are the advantages & disadvantages of welded joints over riveted joints?
- Sketch two views of a knuckle joint and write the equations showing the strength of joint for the most probable modes of failure.

- h) Design a close-coiled helical compression spring to carry a load of 1000 N with a deflection of 25 mm. Assume: Spring index  $C = 6$ ; Modulus of rigidity  $G = 80 \text{ GPa}$  and Maximum shear stress  $\tau_{\max} = 400 \text{ MPa}$ .  
Find: (i) Wire diameter, (ii) Mean coil diameter, (iii) Number of active coils
- i) A semi-elliptical leaf spring has to support a central load of 6 kN. The span of the spring is 1.2 m. The spring consists of 10 plates, each of equal width.  
Given: Allowable bending stress  $\sigma = 300 \text{ MPa}$ ; Modulus of elasticity  $E = 2 \times 10^5 \text{ MPa}$ ; Width of each plate  $b = 60 \text{ mm}$ .  
Find: (i). Thickness of each plate, (ii). Deflection of the spring.
- j) A vertical shaft is supported on a footstep bearing and carries a load of 10 kN. The shaft rotates at 200 rpm. Assume: Permissible bearing pressure  $p = 0.5 \text{ N/mm}^2$ , Coefficient of friction  $\mu = 0.05$   
Find: (i) Diameter of the bearing, (ii) Power lost due to friction
- k) Design a journal bearing for a shaft carrying a load of 12 kN and running at 180 rpm.  
Given: Permissible bearing pressure  $p = 1.5 \text{ N/mm}^2$ , Length to diameter ratio  $L/D = 1.5$ , Coefficient of friction  $\mu = 0.04$ .  
Find: (i) Diameter and length of the bearing, and (ii) Power lost due to friction
- l) Explain what do you understand by A.M. Wahl's factor and state its importance in the design of helical springs.

### Part-III

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

- Q3 a)** Design a rigid flange coupling to transmit 20 kW power at 200 rpm. (10)  
Assume: Permissible shear stress for shaft, key, and bolt  $\tau = 40 \text{ MPa}$   
Permissible crushing stress for key  $\sigma_c = 80 \text{ MPa}$  and the shaft is solid  
Pitch circle diameter = 3x shaft diameter  
Find: (i) Diameter of the shaft (ii) Size of key (iii) Number and diameter of bolts
- b)** 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 the bolt required according to any two theories of failure. Take permissible tensile stress at elastic limit = 100 MPa and Poisson's ratio = 0.3. (6)
- Q4 a)** A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. (8)
- b)** A helical spring is made from a wire of 8 mm diameter and is of outside diameter 75 mm. The spring has 6 numbers of active coils. If the permissible stress in shear is  $350 \text{ N/mm}^2$  and the modulus of rigidity is  $84 \text{ kN/mm}^2$ . Find the axial load, which the spring can take and the deflection produced. (8)
- Q5** Write short notes (any 4) (4 x 4)  
(i) Preferred Numbers (ii) Mitigation of stress concentration (iii) Endurance Limit and factors affecting it (iv) Notch Sensitivity (v) different types of fits
- Q6** Design a suitable ball bearing for an axial flow compressor to carry a radial load of 2.5 kN and a thrust load of 1.3 kN. The service imposes a light shock with shock factor 1.5 and bearing will be in use for 35 hours per week for 4 years. The speed of is 900 rpm and diameter of shaft is 45 mm. Assume  $X = 0.56$  and  $Y = 1.4$ . (16)

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCI6C001

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Design of Steel Structures

BRANCH(S): CIVIL

Time: 3 Hours

Max Marks: 100

Q.Code: V144

Answer Q1 (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)**

- Define partial safety factor for loads.
- State the different types of connections commonly used in steel design.
- Define efficiency of a joint.
- Where tension members are provided in steel structures?
- What do you mean by a member in pure tension?
- Where plate girders are used?
- What are the load combinations that are usually considered for truss analysis?
- Write the names of commonly used lateral systems in column.
- Define buckling load.
- What is effective diameter of a rivet?

**Part-II**

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

- State the advantages and disadvantages of steel structures.
- Write the advantages and disadvantages of riveted connection.
- State different types of welds and their symbols.
- Factors Affecting the Strength of Tension Members.
- Explain the different types of failure of a tension member.
- What is the function of a column base? Explain briefly about different types of column base commonly used in practice with figure.
- Differentiate between web buckling and web crippling of a beam.
- Calculate the value of the least radius of gyration for a compound column consisting of ISHB 250@536.6 N/m with one cover plate 300 mm x 20 mm on each flange.
- Design a single angle to carry a tensile load of 500 kN. Assume that the length of the member is 3 m.

- j) The plates of a boiler are 10 mm thick, connected by M16 bolts of grade 4.6 at a spacing of 50 mm. If it is lab joint, determine the efficiency of the connection.
- k) State some advantages and disadvantages of plate girders over trusses.
- l) Illustrate the load combinations that are usually considered for truss analysis.

### Part-III

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

- Q3** Determine the rivet value of 18 mm diameter rivets connecting 10 mm plate and in: (i) Single shear and (ii) double shear. The permissible stresses for rivets in shear and bearing are 80 MPa and 250 MPa respectively, and for plate in bearing is 250 MPa. **(16)**
- Q4** Design a column to support an axial load of 700 kN. The column has an effective length of 7 m with respect to the x-axis and 5 m with respect to the y-axis. Take  $f_y = 250 \text{ N/mm}^2$ . **(16)**
- Q5** Design a simply supported beam of effective span 2 m carrying a factored concentrated load of 400 kN at mid span. **(16)**
- Q6** a) Explain various design components of a plate girder with sketches. **(8 x 2)**  
 b) With neat sketch explain lacing and battening column systems.

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REL6D001

6<sup>th</sup> Semester Back Examination: 2025-26  
SUBJECT: Electric Power System Protection  
BRANCH(S): ELECTRICAL  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V147

Answer Q1 (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)**

- Define the selectivity of protective relay.
- What are the advantages of static relay over electromagnetic relay?
- How are the CTs on the primary and secondary side of a Y- $\Delta$  transformer connected for differential protection and why?
- What is Rate of Rise of Restriking Voltage?
- Define the term – burden and over reach as related to protective relay.
- Write two limitations of SF<sub>6</sub> circuit breakers.
- Draw the different over current relay characteristics based on operating time.
- What are the disadvantages of the simple differential protection scheme?
- Name the types of faults that can be protected by the Bucholz Relay.
- What is back-up protection?

**Part-II**

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

- What is 'Restricted earth fault protection' of transformer? Justify the use of the term 'Restricted'.
- Describe solid grounding and resistance grounding for earthing the neutral point.
- Compare numeric relay with electromagnetic relay.
- A three phase 66 kV/11 kV transformer is connected as star/delta. The transformer is protected by Mertz-Price circulating current system. Protecting current transformers on the low voltage side have a ratio of 250/5. Find the ratio of the current transformer on high voltage side.
- Describe the zones of protection. Explain the zones of protection for different distance relay.
- Explain in details Phase comparison Current Protection scheme.
- Explain the operation of air blast circuit breaker with neat sketch.
- Describe the vacuum circuit breaker with neat diagram and explain its merits and limitations.

- i) Explain impedance relay characteristic on the R-X diagram. Discuss the range setting of three impedance relays placed at a particular location. Discuss why the I zone unit is not set for the protection of 100 % of the line.
- j) What type of a protective scheme is employed for the protection of the field winding of the alternator against ground faults?
- k) With neat sketch and phasor diagram explain how a negative phase sequence relay is employed for protection of electrical power system?
- l) Explain with essential sketches the working of different types of Oil circuit Breaker.

### Part-III

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

- |           |                                                                                                                                                                                                                           |             |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Q3</b> | Determine the time of operation of a relay of rating 5 amps, 2.2 sec IDMT and having relay setting of 125 % with TMS = 0.6. It is connected to a supply circuit through a CT of 400/5 ratio. The fault current is 4000 A. | <b>(16)</b> |
| <b>Q4</b> | Explain the working principle, construction, and advantages of SF <sub>6</sub> circuit breakers.                                                                                                                          | <b>(16)</b> |
| <b>Q5</b> | Explain re-striking voltage, recovery voltage, and RRRV with waveforms and its Significance. Derive the mathematical relationship for resistance switching.                                                               | <b>(16)</b> |
| <b>Q6</b> | Describe the operating principle, constructional features and area of applications of directional over current relay                                                                                                      | <b>(16)</b> |

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCI6C002

6<sup>th</sup> Semester Back Examination: 2025-26  
SUBJECT: Hydrology & Irrigation Engineering  
BRANCH(S): CIVIL  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V259

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)

- What type of rainfall data is obtained from tipping-bucket and weighing-type rain gauges?
- What is a hyetograph and how is it different from a mass curve?
- Define basin lag time and hydrograph attenuation.
- What is a flow duration curve?
- Differentiate between Gross Command Area (GCA) and Culturable Command Area (CCA). Define irrigation intensity.
- What is a divide wall in a diversion headwork? State its function.
- Distinguish between high dams and low dams based on their characteristics.
- Define phreatic line and flow net in seepage analysis.
- What is the purpose of a drainage gallery in a gravity dam?
- Write the forces acting on a gravity dam.

Part-II

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

- Describe different types of rain gauges with their working principles.
- Explain the concept of Depth–Area–Duration (DAD) curve and its applications.
- From the given storm data of a 500 ha watershed, determine the  $\phi$ -index and duration of effective rainfall:

|                          |   |     |     |     |     |     |     |      |      |      |
|--------------------------|---|-----|-----|-----|-----|-----|-----|------|------|------|
| Time from start (h)      | 0 | 2   | 4   | 6   | 8   | 10  | 12  | 14   | 16   | 18   |
| Cumulative Rainfall (cm) | 0 | 0.8 | 2.0 | 3.8 | 4.6 | 8.5 | 9.9 | 10.9 | 11.5 | 12.7 |

Given runoff volume = 0.29 Mm<sup>3</sup>.

- A rainfall of 35 cm has a return period of 150 years. Determine:
  - Probability of non-occurrence in next 75 years
  - Probability of occurrence in the next year
- Explain the two-step method of discharge measurement. Describe the area-velocity method.

- f) Explain the losses in irrigation canals and methods to control them.
- g) Calculate the irrigation interval for the following data:  
 Field capacity = 28 %, Wilting point = 11 %  
 Dry unit weight = 11 kN/m<sup>3</sup>  
 Root zone depth = 0.85 m  
 Daily water requirement = 18 mm/day
- h) Explain Bligh's creep theory and its application in designing safe hydraulic structures.
- i) Describe the different modes of failure of gravity dams and their stability criteria.
- j) Design a channel using Lacey's theory to carry 85 m<sup>3</sup>/s discharge (silt factor = 1.2).
- k) Derive the relationship between duty, delta, and base period. Discuss factors affecting duty.
- l) Explain different types of earthen dams and criteria for selecting a suitable section.

### Part-III

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

- Q3** a) Explain evaporation measurement techniques and empirical equations used. (8)  
 b) Explain Gumbel's method for flood frequency analysis. (8)
- Q4** a) Explain the mass curve method for determining reservoir capacity with a neat sketch. (8)  
 b) Discuss different methods of streamflow measurement. (8)
- Q5** a) Explain various types of cross-drainage works with neat sketches. Classify aqueducts based on construction material. (8)  
 b) Explain Khosla's theory for seepage analysis and discuss the concept of critical exit gradient. (8)
- Q6** a) Draw the elementary profile of a gravity dam and explain all forces acting on it. (8)  
 b) A trapezoidal gravity dam has: (8)  
 Height = 100 m, crest width = 6 m, base width = 75 m,  
 Upstream face vertical, freeboard = 4 m.  
 Calculate the maximum principal stress at the toe.  
 Assume:  
 Unit weight of concrete = 23.5 kN/m<sup>3</sup>  
 Consider self-weight, water pressure, and uplift pressure only.

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RME6C002

6<sup>th</sup> Semester Back Examination: 2025-26  
SUBJECT: Machining Science and Technology  
BRANCH(S): MECH  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V149

Answer Q1 (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 are the values of main cutting-edge angle and inclination angle in pure orthogonal turning?
  - b) What is oblique machining process over orthogonal machining process?
  - c) How Surface Roughness is measured?
  - d) What is notch wear during a turning of steel?
  - e) What are properties of fluid used in turning of hardened steel?
  - f) Show Directrix and Generatrix in a milling machine.
  - g) What is the order of frequency used in USM?
  - h) State the major advantages in a quick return mechanism process.
  - i) A hole is to be made on a metal matrix ceramic plate with 1  $\mu\text{m}$ . Which is most suitable process among AJM, USM, EDM, LBM?
  - j) What are the tools used in ECM and EDM?

**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 – 4°, 5°, 6°, 7°, 10°, 75°, 0.8 mm. Show all the angles in proper planes in ORS 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 120 minutes to 30 minutes due to increase in cutting velocity from 180 m/min. to 360 m/min. in turning low carbon steel. Find the constant and index.
  - e) Show the Frictional Force and Tangential Force in the Merchant circle diagram for machining of a cast iron material.
  - 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 a Velocity vector diagram among (Cutting Velocity)  $V_c$ , (Feed Velocity)  $V_f$  and (Shear Velocity)  $V_s$ .
- h) Show a complete set of fixtures and jig with drawings for a milling operation.
- i) Compare the Conventional, Semi-automatic, and Automatic lathe with all the features.
- j) State Machinability and Economics of Machining with few examples.
- k) What are the advantages of Wire Cut EDM process over conventional EDM process?
- l) Show a short note on Plasma Arc Machining (PAM) process?

### Part-III

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

- Q3** Compare the both strain gauge and piezo electric dynamometer? Which is more reliable and accurate between the two? **(16)**
- Q4** How Gear Hobbing is different from Gear Milling process? Explain with proper sketches. **(16)**
- Q5** Show a complete Electro Chemical Machining (ECM) process and its advantages over others with suitable sketches. **(16)**
- Q6** How Laser is produced? Write a short note on drilling of a  $Al_2O_3$  ceramic plate of 20 mm thick and 0.5 mm diameter by Laser Beam Machining (LBM). **(16)**

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 03

Course: B.Tech/IDD(B.tech & M.Tech)

Sub\_Code: ROE6A001

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Optimization in Engineering

BRANCH(S): AE, AEIE, AERO, AG, AUTO, BIOMED, BIOTECH, CE, C&EE, CHEM, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, MMEAM, PLASTIC, PT

Time: 3 Hours

Max Marks: 100

Q.Code: V006

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)

- What is the unboundedness criterion in the Simplex algorithm?
- Explain the role of Artificial Variables in the Big-M method.
- Correct the statement if required: "Sensitivity analysis is a technique to determine how feasible solution to a linear programming problems changes in response to problem outputs."
- In an assignment problem there are 6 workers and 4 jobs. Find the total number of possible assignments.
- Why is the Hungarian Method more efficient than the Simplex method for Assignment problems?
- Define the Degeneracy condition in a Transportation Problem with  $m$  sources and  $n$  destinations.
- Define constrained nonlinear optimization problem. Give an example of it.
- What is the fundamental difference in the interval reduction approach between the Fibonacci and Golden Section Search methods?
- Define "Queue discipline" within the context of queuing models with a suitable example.
- Break down the Kendall notation  $M/M/1$  used in queuing theory and interpret the meaning of each component in terms of arrival process, service mechanism, and system structure.

Part-II

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

- What is the role of sensitivity analysis in linear programming? Discuss how changes in the objective function coefficients affect the optimal solution.
- Using the Graphical method solve the LPP  $Max\ z = 3x_1 + 5x_2$ , Subject to  $x_1 + 2x_2 \leq 20, x_1 + x_2 \leq 15, x_2 \leq 18, x_1, x_2 \geq 0$ .
- Using the Simplex method solve the LPP  $Max\ z = 5x_1 + 3x_2$ , Subject to  $5x_1 + 2x_2 \leq 10, 3x_1 + 5x_2 \leq 15, x_1, x_2 \geq 0$ .

- d) What is the Branch and Bound algorithm? Explain its methodology and illustrate how it is used to solve integer programming problems.

#### Men

|       | $M_1$ | $M_2$ | $M_3$ | $M_4$ |
|-------|-------|-------|-------|-------|
| $T_1$ | 18    | 26    | 17    | 11    |
| $T_2$ | 13    | 28    | 14    | 26    |
| $T_3$ | 38    | 19    | 18    | 15    |
| $T_4$ | 19    | 26    | 24    | 10    |

- e) Solve the assignment problem **Tasks**
- f) Obtain the initial basic feasible solution for the following transportation problem using Vogel's approximation method:

|   | D  | E  | F  | G  |    |
|---|----|----|----|----|----|
| A | 5  | 3  | 6  | 2  | 19 |
| B | 4  | 7  | 9  | 1  | 37 |
| C | 3  | 4  | 7  | 5  | 34 |
|   | 16 | 18 | 31 | 25 |    |

**Availability**

**Demand**

- g) Minimize the non-linear function  $f(x) = x^2 - 4x + 4$  within the interval  $[0, 5]$  using the Fibonacci search method. Perform up to 2 iterations.
- h) Apply the method of Lagrange multipliers to find the optimum value of the function  $z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$  subject to the equality constraint  $x_1 + x_2 + x_3 = 15$ .
- i) Describe the principles behind the Projected Gradient Method for solving optimization problems with equality constraints.
- j) Describe the operational characteristics of a multiple-server Markovian queuing model (M/M/c).
- k) Differentiate between finite-source and infinite-source queuing models. How does the assumption of a finite population affect the mathematical formulation of the arrival rate?
- l) Discuss the general characteristics and fundamental components that define a queuing system.

#### Part-III

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

- Q3** a) Using Big-M method determine the optimal solution of the LPP  $Max\ z = 4x_1 + 3x_2$ , Subject to  $2x_1 + x_2 \geq 10, -3x_1 + 2x_2 \leq 6, x_1 + x_2 \geq 6, x_1, x_2 \geq 0$ . (8 x 2)
- b) Construct the dual of the primal problem  $Min\ z = 2x_1 + 2x_2 + 4x_3$ , Subject to  $2x_1 + 3x_2 + 5x_3 \geq 2, 3x_1 + x_2 + 7x_3 \leq 3, x_1, x_2, x_3 \geq 0$ . And solve it using the Dual Simplex method.

- Q4** Obtain the initial basic feasible solution for the following transportation problem: (16)

|   | D  | E  | F  | G  |    |
|---|----|----|----|----|----|
| A | 19 | 30 | 50 | 10 | 7  |
| B | 70 | 30 | 40 | 60 | 9  |
| C | 40 | 8  | 70 | 20 | 18 |
|   | 5  | 8  | 7  | 14 |    |

**Demand**

From the obtained initial basic feasible solution to the above transportation problem, perform an optimality test using the Modified Distribution (MODI) method to determine if the current shipping cost is minimized

- Q5** a) Solve the following Non-Linear Programming Problem  $Max\ z = 10x_1 - x_2^2 + 10x_2 - x_2^2$  Subject to  $x_1 + 2x_2 \leq 14$ ,  $x_1 + x_2 \leq 9$ ,  $x_1, x_2 \geq 0$  using Kuhn-Tucker conditions. **(8 x 2)**
- b) Solve the nonlinear programming problem:  $Min\ z = x_1^2 + x_2^2 + x_3^2$ , subject to constraints  $2x_1 + x_2 \leq 5$ ,  $x_1 + x_2 \leq 2$ ,  $x_1 \geq 1$ ,  $x_2 \geq 2$ ;  $x_3 \geq 0$ .
- Q6** a) Derive the steady-state probability distributions for a Markovian queuing model constrained by limited queue capacity (M/M/1/K). **(8 x 2)**
- b) A single service counter observes customers arriving at an average rate of 4 per hour. The service time is exponentially distributed with a mean of 10 minutes. Calculate the probability that the system is completely empty, and find the average length of the queue.

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REL6C001

6<sup>th</sup> Semester Back Examination: 2025-26  
SUBJECT: Power System Operation and Control  
BRANCH(S): EEE, ELECTRICAL  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V047

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)**

- Write the equality and inequality constraints for solving the economic load dispatch problem.
- Write down the disadvantages of the Gauss-Seidel method.
- What do you mean by PQ bus or load bus?
- What is the difference between Economic load dispatch & Unit Commitment?
- A 100 MVA 11 KV generator has an inertia  $H = 4$ , then what is the stored energy in the rotor at synchronous speed?
- Consider 100-MW 50-Hz generator in the previous example. It has a regulation parameter  $R$  of 4 %. By how much will the turbine power increase if the frequency drops by 0.1 Hz with the speed changer setting unchanged.
- Define "load factor"?
- What do you mean by Dynamic stability in a power system?
- The PU value of impedance is 0.7 at base values 300 MVA and 11 KV. Find the new PU values if the base values changed to 4400 MVA and 33 KV.
- What is the basic role of ALFC?

**Part-II**

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

- What do you mean by p.u. value of any electrical parameter? How base values are selected for a power system
- Explain the importance of the slack bus in load flow studies.
- Derive the penalty factor in the economics dispatch problem.
- Given the fuel characteristics of two generators as  
 $F_1 = 0.05P_1^2 + 20P_1 + 15$  Rs./ hr  
 $F_2 = 0.06P_2^2 + 16P_2 + 20$  Rs./ hr  
The minimum and maximum power generations are 30 MW and 150 MW. Give the economical scheduling for total load of 150 MW.

- e) A loss-free alternator supplies 50 MW to an infinite bus, the steady state stability limit being 100 MW. Determine the load angle if the alternator will remain stable if the input to the prime mover of the alternator is abruptly increased by 40 MW.
- f) Two generators are supplying power to a system. Their ratings are 50 and 500 MW respectively. The frequency is 50 Hz and each generator is half-loaded. The system load increases by 110 MW and as a result the frequency drops to 49.5 Hz. What must the individual p.u. regulation be if the two generators should increase their turbine powers in proportional to their ratings?
- g) A power system has impedances between various buses  
 Bus 1 - reference  $j2 \Omega$ , bus 2 - reference  $j2 \Omega$ , bus 3 - reference  $j2 \Omega$   
 Bus 1 to bus 3  $j0.2 \Omega$ , 2 - 3  $j0.4 \Omega$ , 1 - 4  $j0.4 \Omega$ , 2 - 4  $j0.4 \Omega$ , 3 - 4  $j0.4 \Omega$   
 Draw the configuration of the system and find the bus admittance matrix.
- h) Derive the swing equation of the rotor. Derive the condition of stability after following a disturbance.
- i) Explain the effect on the generator if the sudden increase in mechanical output to this synchronous generator by using an equal area criterion.
- j) Compare the Gauss-Seidel load flow method with the Newton-Raphson method.
- k) What is the significance of the Jacobian matrix in load-flow analysis?
- l) Write down the short notes on the fast decoupled method for load flow studies of power system.

### Part-III

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

- Q3** A two-bus system is shown in the 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  $\lambda$  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** Distinguish between steady-state stability and transient stability of a power system? How to improve transient stability? (16)
- Q5** Draw the complete block diagram representation of ALFC of single area system and describe the role of different components. (16)
- Q6** Derive the critical clearing angle for the fault in the middle of a parallel transmission line. (16)

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCS6D001

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Real-Time System

BRANCH(S): CSE, CSEAI, IT

Time: 3 Hours

Max Marks: 100

Q.Code: V308

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 real-time system and give two examples.
- b) Differentiate between hard real-time and soft real-time tasks.
- c) What is the role of safety and reliability in real-time systems?
- d) Explain the concept of earliest deadline first (EDF) scheduling.
- e) What is priority inversion?
- f) Define Priority Inheritance Protocol (PIP).
- g) What are the features of a real-time operating system?
- h) Explain POSIX-RT.
- i) What is concurrency control in real-time databases?
- j) Explain real-time communication in LAN.

**Part-II**

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

**(6 x 8)**

- a) Explain the characteristics of real-time tasks.
- b) Differentiate between clock-driven and event-driven scheduling.
- c) What is Rate Monotonic Algorithm (RMA)? State its limitations.
- d) Explain Highest Locker Protocol (HLP).
- e) Discuss multiprocessor task allocation in real-time systems.
- f) Explain centralized clock synchronization in distributed real-time systems.
- g) Compare Unix and Windows as real-time operating systems.
- h) What is benchmarking in real-time systems?
- i) Explain temporal data in real-time databases.
- j) Discuss real-time communication over packet-switched networks.
- k) What are commercial real-time databases?
- l) Explain the role of audits in real-time systems.

### Part-III

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

- Q3** a) Model timing constraints for a railway signaling system. (8)  
b) Apply EDF scheduling to a set of tasks with deadlines and show feasibility. (8)
- Q4** a) Demonstrate priority inversion with an example and explain how PCP resolves it. (8)  
b) Discuss fault-tolerant scheduling of tasks in multiprocessor real-time systems. (8)
- Q5** a) Compare features of three commercial real-time operating systems (e.g., VxWorks, QNX, RTLinux). (8)  
b) Explain benchmarking parameters used to evaluate real-time operating systems. (8)
- Q6** a) Design a real-time database for an airline reservation system, highlighting concurrency control. (8)  
b) Discuss real-time communication requirements for a smart grid application. (8)

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

B.Tech  
RME6D001

6<sup>th</sup> Semester Back Examination: 2025-26  
SUBJECT: Smart and Composite Materials

BRANCH(S): MECH, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: V309

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)**

- Name any two types of synthetic organic fibers used as reinforcements.
- What is interfacial bonding in composites?
- What is diffusion bonding in the context of MMC processing?
- What are in situ processes in MMC manufacturing?
- Differentiate between CVI and CVD processes.
- State the role of zirconia in zirconia-toughened alumina composites.
- List two advantages of PEEK matrix over epoxy matrix.
- What is autoclave moulding in PMC processing?
- Define Poisson's ratio in the context of unidirectional composites.
- What is a honeycomb structure and where is it used?

**Part-II**

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

- Describe the classification of composite materials with suitable examples for each category.
- Discuss the manufacturing and properties of glass fibers and carbon fibers used in composites.
- Describe the processing and structure of multi filamentary superconductors.
- Explain CVD and PVD deposition techniques for manufacturing metal matrix composites.
- Describe the sol-gel processing and CVI techniques for fabrication of CMCs.
- Explain zirconia toughening mechanism in alumina matrix composites and its significance.
- Describe thermosetting and thermoplastic polymer matrices used in PMCs, with their relative merits and demerits.
- Summarize the recycling strategies for polymer matrix composites.

- i) Discuss environmental degradation mechanisms in PMCs and their effects on mechanical properties.
- j) Describe sandwich structures and honeycomb core arrangements in structural composites.
- k) Discuss the effect of thermal and moisture effects on micromechanical behaviour of composites.
- l) Discuss transverse tensile and compressive strength models and in-plane shear failure in unidirectional composites.

### **Part-III**

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

- |           |                                                                                                                                                                                                                |             |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Q3</b> | Discuss in detail the various processing methods for metal matrix composites under solid-state, liquid-state, and deposition categories. Compare their suitability, advantages, and limitations with examples. | <b>(16)</b> |
| <b>Q4</b> | Explain sol-gel processing and CVI technique for CMC fabrication with neat diagrams.                                                                                                                           | <b>(16)</b> |
| <b>Q5</b> | With neat diagrams, explain the filament winding and pultrusion processes with their applications.                                                                                                             | <b>(16)</b> |
| <b>Q6</b> | Derive and explain the micromechanics models for stiffness of unidirectional composites: longitudinal stiffness and transverse stiffness.                                                                      | <b>(16)</b> |

Registration No.:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCS6C001

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Software Engineering

BRANCH(S): CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ELECTRICAL & C. E.

Time: 3 Hours

Max Marks: 100

Q.Code : V163

Answer Q1 (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)

- What is a software crisis?
- Define the term "software product."
- Name two agile development models.
- What is the purpose of abstraction and decomposition in handling complexity?
- Define Unit Testing.
- Write the major shortcomings of iterative waterfall model.
- What do you mean by white box testing?
- When is regression testing typically performed?
- What are the objectives of feasibility study phase of software development?
- What are the main shortcomings of DFD as a tool for performing structured analysis?

Part-II

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

(6 x 8)

- Explain the Spiral Model of software development and discuss why it is often referred to as a "meta-model".
- What is an SRS? Describe the importance of the Software Requirement Specification (SRS) and list the key components as per IEEE 830 guidelines.
- Explain the concepts of Cohesion and Coupling. Why is "high cohesion and low coupling" consideration a goal of good software design?
- Differentiate between Functional and Non-functional requirements. Provide at least two examples for each.
- Explain Cyclomatic Complexity. How is it calculated, and how does it help a tester determine the number of test cases required for a program?
- Describe the SEI Capability Maturity Model (CMM). Briefly explain the five levels of process maturity.

- g) Distinguish between Software Reverse Engineering and Software Reengineering. When would an organization choose one over the other?
- h) Explain the concept of Software Reliability. Discuss how reliability measures and growth modeling are used to predict software quality.
- i) What is RAD model? Explain.
- j) Design the black box test suite for a function named Quadratic Solver. Quadratic Solver accepts 3 floating point numbers (a, b, c) representing a quadratic equation of the form  $ax^2 + bx + c = 0$ . It computes and displays the solution.
- k) Write different types of requirements gathering activities that the analysts use to gather requirements from a customer.
- l) Discuss the major differences between the function oriented and the object-oriented approaches to software design. Corroborate your answer through suitable examples.

### Part-III

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

- Q3** Discuss the evolution of software process models from the Classical Waterfall Model to the Spiral Model. Explain why the Waterfall model is often considered impractical for large projects and how the Spiral model addresses these issues through its risk-driven approach? **(16)**
- Q4** Design the black box test suite for a program that accepts two strings and checks if the first string is a substring of the second string and displays the number of times the first string occurs in the second string. **(16)**
- Q5** Describe the methodology of Function-Oriented Software Design. Explain how Structured Analysis using Data Flow Diagrams (DFDs) is transformed into a Structured Design using Structure Charts. **(16)**
- Q6** Explain the fundamental principles of Service-oriented Architecture (SOA) and Software as a Service (SaaS) architecture. Discuss in brief with suitable example how they differ from traditional Client-Server Software Engineering. **(16)**