

Registration No:

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCS5D006

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Computer Graphics

BRANCH(S): CSE, CSEAIME, CSIT, CST, IT

Time: 3 Hour

Max Marks: 100

Q Code : N288

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)

- What is interactive computer graphics?
- List two polygon filling methods.
- What are the raster and vector graphics?
- Define clipping and clip window.
- What are the advantages of B-spline over Bezier curve?
- What is dithering?
- How will you represent a curve in graphics?
- What is translation?
- State the concept of vanishing point.
- How CMY is converted to RGB?

**Part-II**

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

- Rotate a triangle placed at A (0, 0), B (1, 1) and C (5, 2) by an angle 45 with respect to point P (-1, -1).
- Explain back-face removal algorithm for hidden surface elimination.
- Explain what do you mean by dithering? How is it overcome?
- Difference between DDA and Bresenham's line drawing algorithm.
- What is the use of ray tracing methods? Describe basic ray tracing algorithm in detail.
- Differentiate between parallel projections from perspective projection.
- Explain the working principle of Gouraud surface rendering algorithm.
- What are the ways to shade the polygons? Elaborate.
- What is object space and image space approaches for hidden surface removal?
- What is the use of ray tracing methods? Describe basic ray tracing algorithm in detail.

- k) In what scenarios would you choose to use a perspective projection instead of an orthographic projection? How do they differ in terms of the final image output in 3D graphics?
- l) Given a triangle with corner coordinates (0, 0), (1, 0) and (1, 1). Rotate the triangle by 90 degree anticlockwise direction and find out the new coordinates.

### Part-III

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

- Q3 Explain the methods involving 2D transformation in computer graphics. Solve the following two numerical (8x2)
- a) Given a circle C with radius 10 and center coordinates (1, 4). Apply the translation with distance 5 towards X axis and 1 towards Y axis. Obtain the new coordinates of C without changing its radius
- b) Given a square with coordinate points A (0, 3), B (3, 3), C (3, 0), D (0, 0). Apply the translation with distance 1 towards X axis and 1 towards Y axis. Obtain the new coordinates of the square.
- Q4 What is Bezier curve? Write the basic equations for generating Bezier curve. Discuss its properties. Derive Bezier matrix for cubic Bezier curve. (16)
- Q5 Why illumination models are used? Explain the various kinds of illumination models. (16)
- Q6 Write short notes on the followings (4x4)
- Applications of computer graphics
  - Window-to-viewport transformation
  - Composite transformation
  - CMY color model

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RC560692

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Artificial Intelligence and Machine Learning

BRANCH(S): AE, AG, CSE, CSEAIME, CSIT, ELECTRICAL & C.E, ELECTRONICS & C.E, IT, MINING

Time: 3 Hour

Max Marks: 100

Q.Code : N371

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)

- Which agent is the most powerful agent in artificial intelligence?
- Define a rational agent in the context of Artificial Intelligence.
- Differentiate between informed and uninformed search with example.
- State two differences between proposition logic and first order predicate logic.
- What do mean by uncertainty in reasoning?
- Differentiate between worst ordering and ideal ordering in alpha-beta pruning.
- Explain with example about unification.
- Is Bayesian network supervised or unsupervised? Justify your answer.
- What are the concepts of statistical learning?
- Differentiate between knowledge representation and search.

Part-II

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

- How are Artificial Intelligence and Machine Learning related?
- Explain with example what is Means-Ends-Analysis.
- Describe the concept of a multi-agent system and elucidate the advantages and challenges associated with coordination and interaction among multiple agents within an environment.
- What is best first search? Explain its advantages over BFS and DFS with a suitable example.
- Is A\* algorithm able to find a suitable solution from the state space graph of a problem. Justify your answer with suitable explanation.
- Differentiate between forward chaining and backward chaining with example.
- Explain the working of alpha beta pruning with example. How it is different than minimax algorithm?



- h) From a standard deck of playing cards, a single card is drawn. The probability that the card is king is  $4/52$ , then calculate posterior probability  $P(\text{King}|\text{Face})$ , which means the drawn face card is a king card.
- i) Compare and contrast propositional logic and first-order logic in terms of expressive power and representational capabilities. Provide examples to highlight scenarios where each logic type is more suitable for knowledge representation
- j) What is the difference between neural net learning and genetic learning? Explain with suitable examples.
- k) What are the characteristics of rote learning? Is it good or bad? Justify your answer.
- l) Explain the Maximum-likelihood parameter learning model with example.

### Part-III

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

- Q3** a) Explain the structure of a typical intelligent agent, breaking down its components such as the agent program, percept sequence, and actuators. Explain how these components interact to achieve intelligent behavior in an agent. (8)
- b) Solve the following constraint satisfaction problem (8)
- CROSS  
+ROADS  
-----  
DANGER
- Q4** Write the following sentences in FOPL. (16)
- i) Every athlete is not only strong but also intelligent.
  - ii) Anyone who plays a game or sport is an athlete.
  - iii) Swimming, running and jumping are sports whereas cricket and football are games.
  - iv) Everyone who is both strong and intelligent definitely succeeds in his career.
  - v) Sachin is a very good runner.
  - vi) All sportsmen encourage each other in sports.
  - vii) A player who fails to accept the defeat never wins a game.
  - viii) All my friends are sportsmen and they all like each other.
- Use resolution to prove that Sachin succeeds in his career.  
(NB: Use only the required axioms for proof)
- Q5** a) What are the causes of uncertainty in real world? Explain the need of probabilistic reasoning in AI with justification. (8)
- b) State Baye's theorem in artificial intelligence. Explain briefly how Baye's theorem calculates the prediction of an event with respect to addition of new cause. (8)
- Q6** a) What are the two main classes of statistical learning? Explain with examples. Write the applications of statistical learning. (8)
- b) Explain the architecture of rule based expert system with neat sketch. Describe the functions of each block. (8)



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Course: B.Tech  
Sub\_Code: RME5D001

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Automobile Engineering

BRANCH(S): MECH, MMEAM

Time: 3 Hour

Max Marks: 100

Q.Code : N259

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 are the important components of an engine?
- What is tractive effort?
- Differentiate between chassis and body of an automobile.
- How hydraulic brakes work?
- What is overdrive and how is it achieved?
- Differentiate between semi and fully automatic transmission.
- What is the principle of correct steering?
- Which steering mechanism is generally used in passenger cars?
- How does the electrical charging system work?
- How are batteries used in electric vehicles (EV) specified?

**Part-II**

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

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

### Part-III

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

- Q3 Explain with a neat sketch the working of the electrical system of an automobile. (16)
- Q4 Draw the Layout of an all-wheel drive transmission system and explain the main function of the different components of the transmission system. (16)
- Q5 Explain with a neat diagram steering condition for true rolling and explain Ackerman steering geometry working, also find out minimum steering radius. (16)
- Q6 Compare, with neat diagrams working of an Electric Vehicle (EV) power train against IC engine vehicle and write down the advantages of EV. (16)

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Course: B.Tech  
Sub\_Code: PCI5H003

5<sup>th</sup> Semester Back Examination: 2023-24  
SUBJECT: C++ & Object Oriented Programming  
BRANCH(S): CIVIL  
Time: 3 Hour  
Max Marks: 100  
Q.Code: N372

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)

- C++ is object oriented or object-based programming language? Justify your answer.
- What is a generic pointer? Explain with an example.
- Distinguish between overloading and overriding.
- Determine how scope of a variable is differentiated from life of a variable.
- How Abstraction is different from Encapsulation?
- State two importance of scope resolution operator.
- What is the difference between Exception and Error?
- What is Polymorphism?
- Define template. What is the need of template?
- What are the advantages of using a friend function?

**Part-II**

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

- What do you mean by operator overloading? Write a C++ Program to find addition of two complex numbers by overloading + operator.
- Explain dynamic memory allocation mechanism in C++.
- Define String? Write a C++ program to sort 10 strings in alphabetical order.
- Write a program to concatenate two strings.
- Describe the need for command line arguments? Write a C++ program to find largest of three numbers using command line arguments and inline function.
- Distinguish between static binding and dynamic binding.
- What are the various ways of handling exceptions? Which one is the best? Explain with suitable example.
- Write a program to read data from a file and then copy it to another file.



- i) What is constructor overloading? What is the need of constructor overloading in C++? Write a C++ program to find out area and perimeter of rectangle, square, and triangle using constructor overloading.
- j) Define Template Function. Write a template function that swaps the values of two arguments passed to it. In main(), use the function with integers and characters.
- k) Define Multilevel inheritance. Write a C++ program to compute volume, weight, and cost of a box using multilevel inheritance. Weight is 10 times of its volume and cost is 100 times of largest among length, breadth, and height of box.
- l) Define the term Virtual Base class and its implementation in C++. How it is used in function Overloading?

### Part-III

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

- Q3 Write a C++ program to implement stack using class and perform following operations. (16)
- > Check if the stack is full.
  - > Check if the stack is empty.
  - > Insert one element into stack.
  - > Delete one element into stack.
  - > Search one element into stack.
- Q4 What is object-oriented programming language? What are the most important pillars of object-oriented programming language? Explain briefly? Define a class Distance with feet and inches and with a print function to print the distance. Write a non-member function max which returns the larger of two distance objects, which are arguments. Write a main program that accepts two distance objects from the user compare them and display the larger. (16)
- Q5 What is Runtime Polymorphism? Write a program that implements pure virtual function. (16)
- Q6 Discuss all types of constructors with an example. (16)

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Course: B.Tech  
Sub-Code: PME5H002

5<sup>th</sup> Semester Back Examination: 2023-24  
SUBJECT: Human Resource Management-I  
BRANCH(S): MECH

Time: 3 Hour  
Max Marks: 100  
Q.Code: N357

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

(2 x 10)

Q1 Answer the following questions:

- Define Human Resource Management
- What is Human Resource Planning? State in few lines.
- What do you understand by Recruitment?
- What is the purpose behind interview?
- Does Training Need Assessment require before Training? Why?
- What is induction you understand for the organization?
- What do you understand by on-the-Job Training?
- What is Performance Management? State in few lines.
- Compensation & benefits are essential aspects of HRM. State in few lines.
- What are appraisal errors in the organization?

Part-II

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

- What are the objectives of Performance Appraisal? Also give brief about different types of Performance Appraisal
- What is MBO? Explain the process and steps of MBO.
- What are the different types of Training Program you are familiar with? Explain.
- What are the Emerging Trends of HRM on Globalized economy? Explain.
- Discuss the objective and process of 360° degree appraisal.
- Does Training essential for the Human Resource in the organization? State importance and explain.
- Clarify and explain the function of Human Resource Management.
- Transactional Analysis leads to create a better culture in the organization. Do you agree? Explain.

- i) What do you understand by Transfer? Why it is required in an organization? Explain.
- j) Mention and explain the modern methods of recruitment used in today's organization.
- k) Elaborate the challenges HR managers are facing in today's Globalized Business Environment.
- l) What are the selection methods you are familiar with? Explain with at least one example.

### Part-III

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

- Q3** The objective of HRM is to optimize the Human Resource utilization in an organization. What are the roles of employers and employees for optimization of Human Resource? Explain. (16)
- Q4** Training and Development of the people in the organization is mandatory. How it brings the benefit to the stake holders? (16)
- Q5** What is the difference between Performance Appraisal and Potential Appraisal? What are the benefits of performance appraisal from the organization on point of view? Explain with different methods of Performance Appraisal. (16)
- Q6** Write notes on (8x2)
- i) Wage concept and types of wage
  - ii) Career planning concept & objectives.



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Course: B.Tech  
Sub\_Code: RME5C001

5<sup>th</sup> Semester Regular / Back Examination: 2023-24

SUBJECT: Basic Manufacturing Processes

BRANCH(S): MECH, MMEAM

Time: 3 Hour

Max Marks: 100

Q.Code : N198

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**

(2 x 10)

Q1

Answer the following questions:

- Sketch the cross section of a sand mould which is ready for pouring and label the various important parts.
- What is draft allowance? How is it provided for patterns?
- Imagine a gating system without a riser. How it will affect the casting?
- What is the primary advantage of powder metallurgy processes over traditional metalworking methods?
- Differentiate between brazing and soldering; highlighting a key characteristic that distinguishes them.
- State the difference between the constant current type and constant voltage type welding machine.
- How does cold rolling differ from hot rolling in terms of the process and product?
- What is hydrostatic extrusion? List out its specific applications.
- What do you understand by creep? Explain the creep curve.
- Explain why the whole of the material (billet) put in the container for extrusion is not extruded.

**Part-II**

Q2

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

- Name the pattern allowances which can be quantitatively specified. Write a brief note on each of them.
- Compare and contrast sand molding, metal molding and investment molding techniques providing suitable examples.
- Describe the properties of molding sand and explain the grain fineness test and permeability test for moulding sands.
- Explain the working of Copula furnace with neat and levelled diagram.
- Explain the TIG and MIG systems of arc welding. Give the applications of each.

- f) Explain the process of resistance welding, their types and provide the advantages and limitations associated with them
- g) Compare smith forging, drop forging and press forging. Highlight the suitability of each method for specific applications and mention potential forging defects
- h) Explain with suitable diagram any two of the atomization process used for preparing the metallic powder.
- i) Show by schematic sketches the process of forward and backward extrusion. Explain the difference between direct and indirect extrusion. Give two examples of components produced by extrusion.
- j) Enumerate the destructive and non-destructive testing of castings and welding products.
- k) Distinguish between wire drawing and tube drawing with neat sketches.
- l) Explain with suitable examples the explosive forming, coating and deposition methods

### Part-III

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

- Q3 What are the defects those are generally found in casting and welding? Explain them with their cause and remedies. (16)
- Q4 In detail, discuss the principles, applications, advantages and limitations of three modern welding methods: Plasma Arc Welding, Laser Beam Welding, and Electron Beam Welding. (16)
- Q5 Discuss the steps involved in powder metallurgy, the advantages it offers over conventional methods, and provide examples of applications where powder metallurgy is particularly beneficial. (16)
- Q6 a) Describe with neat diagram the deep drawing set up in detail with diagram. What the difference between wire drawing and tube drawing? (8x2)
- b) Calculate the ratio of solidification times of two steel cylindrical risers of sizes 360mm in diameter by 720mm height and 720mm in diameter by 360mm in height subjected to identical conditions of cooling.

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Total Number of Pages . 03

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5<sup>th</sup> Semester Regular / Back Examination 2023-24

SUBJECT : CONTROL SYSTEM

BRANCH(S) : AEIE, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C E ETC

Time : 3 Hour

Max Marks : 100

Q.Code : N171

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)

- What is a dynamic system? Explain with suitable example
- Comment on effect of negative feedback on time constant and bandwidth of the system
- Compare the time response graphs of a second order under damped, critically damped and over damped system excited by unit step input
- Draw the bode plot for a lead and lag compensator
- Distinguish between absolute stability, conditional stability and relative stability
- Distinguish between encirclement and encirclement using suitable examples
- List two different frequency response characteristics that can be used to determine a system's transient response.
- Name two methods of finding closed loop frequency response from the open loop transfer function.
- State the condition for the arbitrary pole placement using state feedback.
- Calculate the eigen values of the system matrix  $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$

Part-II

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

- a) A unity feedback system is having forward gain of

$$G(s) = \frac{K}{s(s+7)(s+11)}$$

Using Routh's stability criterion, determine the range of K such that the system will be stable, marginally stable and unstable.

- b) The overall transfer function of a unity feedback control system is given by

$$\frac{C(s)}{R(s)} = \frac{10}{s^2 + 6s + 10}$$

Find  $K_p$ ,  $K_v$  and  $K_a$  and also determine the steady state error for the input

$$r(t) = 1 + t + t^2$$

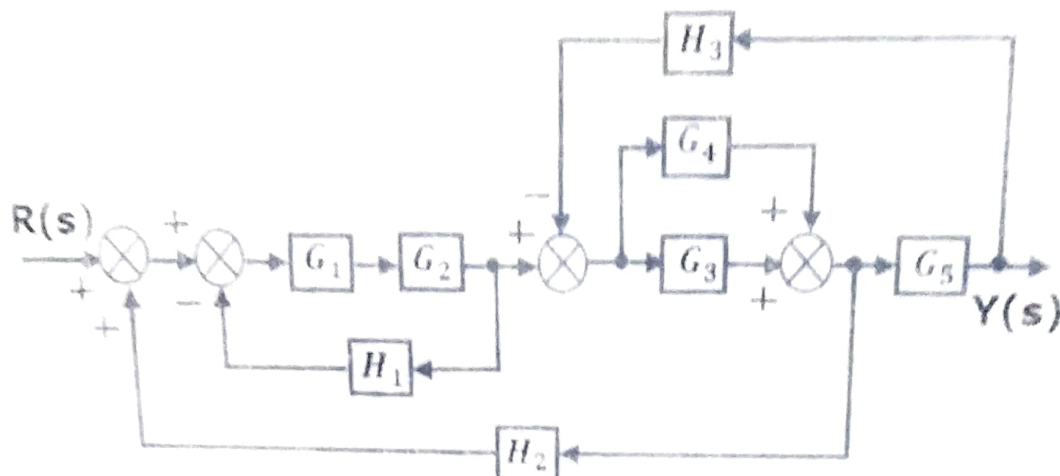


- c) Sketch the root locus plot for the following unity feedback system

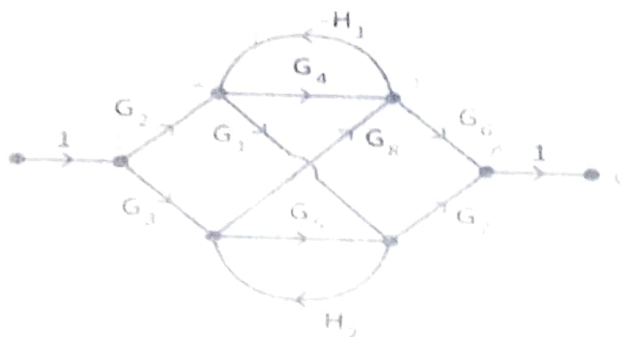
$$G(s) = \frac{K(s+2)(s+4)}{(s^2+6s+25)}$$

Also obtain the value of gain  $K$  for which damping of the system will be 0.5

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



- e) Obtain the overall transfer function  $C/R$  of the following system by using Mason's gain formula



- f) What are constant  $M$  circles? Show that the points representing a constant value of the closed loop gain ( $M$ ) lie on a circle in the  $G$ -plane.
- g) Derive the expression for step response of a second order under damped control system.
- h) Construct bode plot for the system whose open loop transfer function is given below and determine (i) gain margin, (ii) phase margin and (iii) comment on the stability of the closed loop system.

$$G(s)I'(s) = \frac{K}{s(0.5s+1)(0.08s+1)}$$

- i) Discuss in brief about P, PI, PD and PID controllers.
- j) State the advantages of diagonalization and also compute the diagonalizing matrix for the following system matrix.

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 3 & -7 & -5 \end{bmatrix}$$

- k) Applying Jury's stability test, comment on the stability of the discrete time system whose characteristic equation is

$$Q(z) = z^3 + z^2 + 3z + 0.2 = 0$$

- l) Determine the state transition matrix for the following homogenous state equation

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -8 & -6 \end{bmatrix} X$$

Also compute the inverse of the state transition matrix.

### Part-III

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

- Q3 State and explain Nyquist stability criterion. Draw the complete Nyquist plot for the following open loop transfer function and hence comment on the stability of the closed loop system for  $K = 1$ . (16)

$$G(s)H(s) = \frac{K(s+2)}{(s+1)(s-1)}$$

- Q4 Given the transfer function of the system as (16)

$$\frac{Y(s)}{U(s)} = \frac{s^2 + 3s + 3}{s^3 + 2s^2 + 3s + 1}$$

First draw the signal flow graphs and then obtain the state variable formulations in controllable canonical form and observable canonical form.

- Q5 Design a suitable lead compensator, for a unity feedback system having open loop transfer function  $G(s)H(s) = \frac{4K}{s(s+2)}$  so that the compensated system will have static velocity error coefficient  $20 \text{ s}^{-1}$ , minimum phase margin of  $50^\circ$  and minimum gain margin of 10dB (16)

- Q6 Write short notes on (8+8)
- Transfer function modelling of armature-controlled DC servomotor
  - Generalized error coefficients

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Course: B.Tech  
Sub\_Code: RCS5C002

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Database Management Systems

BRANCH(S): CSE, CSEAI, CSEAIME, CSIT, CST, IT

Time: 3 Hour

Max Marks: 100

Q.Code : N343

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)

- What advantages can a DBMS provide when compared to a file system?
- Find the number of candidate keys from the following FDs.
  - $R(A, B, C, D)$  FD =  $\{A \rightarrow B, B \rightarrow C, A \rightarrow C\}$
  - $R(X, Y, Z, W, P)$  FD =  $\{Y \rightarrow Z, Z \rightarrow Y, Z \rightarrow W, Y \rightarrow P\}$
- In Relational model what do you mean by cardinality?
- Let F be the following set of functional dependencies:  
 $\{AB \rightarrow CD, B \rightarrow DE, C \rightarrow F, E \rightarrow G, A \rightarrow B\}$ .  
Show if the FD:  $\{A \rightarrow FG\}$  is logically implied by F.
- A primary key if combined with a foreign key creates what?
- Explain the following terms associated with relational database design: Primary Key, Secondary key, Foreign Key?
- What is ACID property?
- Define Meta data with examples
- What is nested query? How is it different from a correlated query?
- List two reasons why we may choose to define a view?

Part-II

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

- What do you understand by a data model? Explain the difference between conceptual data model and the internal model.
- What are the basic operations for a relational language? How are basic operations represented in relational algebra and SQL?
- Explain the entity integrity and referential integrity constraints. How they are use full in database Design?
- Define and explain the integrity constraints in DBMS.
- Does a relation in a 3<sup>rd</sup> Normal form satisfy the properties of Lossless decomposition and dependency preservation? Explain with an example
- Given  $R(ABCDEFGH)$  with FDs  $F = \{A \rightarrow C, B \rightarrow D, E \rightarrow F, G \rightarrow H, C \rightarrow G\}$ . How many number of candidate keys are there? Which normal form R is in?



- g) What is the goal of query optimization? Why is optimization important?
- h) Why do query optimizers consider only left-deep join trees? Give an example of a query and a plan that would not be considered because of this restriction.
- i) What is normalization? Explain the first and second normal forms using appropriate example.
- j) During its execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain why each state transition may occur.
- k) What is an unsafe query? Give an example and explain why it is important to disallow such queries.
- l) What is update anomalies? Explain with example.

### Part-III

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

- Q3** a) What is normalization? Explain the first and second normal forms using appropriate example. (8x2)  
 b) Define (i) primary key and (ii) foreign key. Suppose relation R (A, B, C, D, E) has functional dependencies:  
 $AB \rightarrow C$   
 $D \rightarrow A$   
 $AE \rightarrow B$   
 $CD \rightarrow E$   
 $BE \rightarrow D$   
 Find all the candidate keys of R.
- Q4** a) Explain various locking technique for concurrency control. (8x2)  
 b) When a transaction is rolled back under timestamp ordering, it is assigned a new timestamp. Why can it not simply keep its old timestamp?
- Q5** What is serializability? Explain conflict serializability and view serializability. (16)  
 Test if the following schedule is conflict serializable or not  
 $R_1(A), R_2(D), W_1(B), R_2(B), W_3(B), R_4(B), W_2(C), R_5(C), W_4(E), R_5(E), W_5(B)$ .
- Q6** What is lossy decomposition? Check whether the following decompositions are lossy or Lossless. (16)  
 (i) Let  $R = ABCD$ ,  $R_1 = AD$ ,  $R_2 = AB$ ,  $R_3 = BE$ ,  $R_4 = CDE$ ,  $R_5 = AE$ ,  $F = \{A \rightarrow C, B \rightarrow C, C \rightarrow D, DE \rightarrow C, CE \rightarrow A\}$   
 (ii)  $R(XYZWQ)$ ,  $FD = \{X \rightarrow Z, Y \rightarrow Z, Z \rightarrow W, WQ \rightarrow Z, ZQ \rightarrow X, R_1(XW), R_2(XY), R_3(YQ), R_4(ZWQ), R_5(XQ)\}$   
 Eliminate redundant FDs from.  
 (i)  $F = \{X \rightarrow Y, Y \rightarrow X, Y \rightarrow Z, Z \rightarrow Y, X \rightarrow Z, Z \rightarrow X\}$   
 (ii)  $F = \{X \rightarrow YZ, ZW \rightarrow P, P \rightarrow Z, W \rightarrow XPQ, XYQ, YW, WQ \rightarrow YZ\}$

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCI5C001

5<sup>th</sup> Semester Regular / Back Examination: 2023-24

SUBJECT: Design of Concrete Structures

BRANCH(S): CIVIL, C&EE

Time: 3 Hour

Max Marks: 100

Q.Code: N204

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

The figures in the right hand margin indicate marks.  
(Use of relevant IS Codes is allowed)

Part-I

(2 x 10)

Q1 Answer the following questions:

- Why does the code limit the compressive strength of concrete in structural design to  $0.67f_{ck}$ , and not  $f_{ck}$ ?
- Calculate the development length required for 20 mm diameter Fe415 grade steel embedded in M20 concrete
- Why is it undesirable to design over-reinforced sections?
- Determine the effective flange width of a T-beam having an effective span of 6.5m, rib width of 250mm and flange thickness 120mm.
- Where combined footing is provided?
- What do you mean by compatibility torsion?
- State various forces acting on retaining wall.
- Define bearing capacity of soil.
- From practical considerations, what is the maximum steel requirement in columns?
- How the shrinkage cracks in the water tank walls are prevented?

Part-II

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

- Draw the stress-strain curves for Fe415 steel showing the special features.
- Describe the different modes of cracking that occur in a reinforced concrete beam.
- State the behaviour of beams with and without shear reinforcements
- Design the reinforcement for a reinforced concrete beam 300mm wide and 400mm deep to resist on ultimate moment of 150kNm. Use M20 grade concrete and Fe415 steel. Assume any other data required suitably as per standard
- A singly reinforced T-beam has a flange width of 900mm, thickness of flange 80mm, width of rib 200mm. Effective depth 550mm. 4 bars of 20mm diameter as tension reinforcement. Find the ultimate flexural strength of the beam section. Use M20 concrete and Fe415 steel

- f) Why does the Code require all columns to be able to resist a minimum eccentricity of Loading?
- g) Determine the ultimate moment of resistance of a beam section of 200mm width and 400mm effective depth, reinforced with 4 bars of 20mm diameter as tension reinforcement and 2 bars of 20mm diameter as compression reinforcement. The effective cover to compression reinforcement is 50mm. Use M20 concrete and Fe415 steel.
- h) Explain clearly the difference in the behavior of one-way slabs and two-way slabs.
- i) Briefly describe the behavior of the various elements of a cantilever retaining wall.
- j) What is combined footing? Under what circumstances is a trapezoidal shape preferred to a rectangular shape for a two-column combined footing?
- k) Discuss briefly the design requirements of a water tank.
- l) Design a circular tank to the following requirements: Diameter of the tank = 3.5m, Depth of water = 3 m, the tank rests on ground, the walls and base slab are not monolithic. Use M20 concrete and Fe415 steel.

### Part-III

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

- Q3** A rectangular beam of 350mm wide and 600mm deep is subjected to an ultimate twisting moment of 120kN-m combined with an ultimate (hogging) bending moment of 160kN-m and an ultimate shear force of 110 kN. Design the torsional reinforcements. Assume M25 concrete, Fe415 steel and mild exposure conditions **(16)**
- Q4** Design a simply supported square slab of side 4.1m to carry a service load of 5.5kN/m<sup>2</sup>. Use M20 concrete and Fe415 steel. Assume any other data required suitably as per standard. **(16)**
- Q5** Design a circular short column with spiral reinforcement to carry a service load of 1500 kN. Show the reinforcement detailing. The effective depth of column is 4 m. Use M20 concrete and Fe415 steel. **(16)**
- Q6** a) Discuss the stability requirement of retaining walls. **(8x2)**  
 b) What is the purpose of a retaining wall? What are the different types of concrete retaining wall?



5<sup>th</sup> Semester Regular / Back Examination, 2023-24

SUBJECT: Electric Drives

BRANCH(S): EEE, Electrical, Electrical &amp; CE

Time: 3 Hour

Max Marks: 100

Q.Code : N206

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 × 10)

- Explain the criteria for steady state stability with the help of speed torque characteristics of motor and load.
- What is load equalization?
- Half hour rating of a motor is 100 kW. Heating time constant is 30 minute and the Maximum efficiency occurs at 72 % of full load. What is the continuous rating of the motor?
- Which method of electrical braking is quickest in reducing the motor speed? Justify.
- Why is CSI fed induction motor operated at constant rated flux?
- Variable frequency control of induction motor yields high torque to current ratio During starting. Why?
- Why a train driven by separately excited dc motors has better adhesion than a train driven by series dc motors?
- Why the traction drives should have large torque at low speeds and when just being started?
- Mention the electric drives used in textile mills with their characteristics
- What are the motors used in traction? Justify their suitability.

## Part-II

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

- Show that the torque to inertia ratio referred to the motor shaft and to the load shaft differ from each other by a factor of  $N$ , where ' $N$ ' is the gear ratio.
- A drive has following equations for motor and load torques.  

$$T = (1 + 2 \omega_m) \quad \text{and} \quad T_l = 3 (\omega_m)^{0.5}$$
 Obtain the equilibrium points and determine their steady state stability.
- Calculate the starting time of a drive with following parameters  
 $J = 10 \text{ Kg-m}^2$ ,  $T = 15 + 0.5 \omega_m$  and  $T_l = 5 + 0.6 \omega_m$

- d) A 220V, 960 rpm, 12.8A separately excited dc motor has armature circuit resistance and inductance of 2 Ohm and 150 mH respectively. It is fed from a single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. Calculate motor torque for  $\alpha = 60^\circ$  and speed = 500 rpm
- e) How the speed and power factor of a wound rotor induction motor are controlled by injecting a voltage in the rotor circuit?
- f) Why stator voltage control is suitable for speed control of induction motors in fan and pump drives?
- g) Explain the working of variable frequency control of multiple synchronous motors with relevant block diagram.
- h) Explain the speed control of 3-phase slip ring induction motor by rotor resistance control.
- i) Outline the demerits of the low power factor and supply current harmonic distortion in the traction drives?
- j) Explain the working principle of current regulated voltage source inverter control of 3-phase induction motor with schematic diagram and waveforms.
- k) Explain various functionalities of microprocessor in Drive Technology with Relevant block diagram.
- l) Explain the drive system and characteristics for the cement mills.

### Part-III

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

- Q3** Explain why a motor of smaller rating can be used for a short time duty. (16)  
 A motor has a continuous rating of 100 kW. The heating and cooling time constants are 50 minutes and 70 minutes respectively. The motor has maximum efficiency at 80% of full load and is employed in an intermittent periodic load cycle consisting of a load period of 10 minute followed by a no load period of 10 minutes. Calculate the value of the load in kW during the load period.
- Q4** What is variable voltage variable frequency (VVVF) induction motor drive? Why is it necessary to maintain constant V/f ratio upto base speed? What is the control strategy for speed control of such drive above base speed? (16)
- Q5** An electric train weighing 500 tonnes climbs an up-gradient with  $G = 10$  and with following speed-time curve. (16)  
 i. Uniform acceleration of 1.5 kmphps for 100 sec  
 ii. Constant speed for 60 min  
 iii. Coasting for 3 min  
 iv. Dynamic braking at 2 kmphps to rest  
 Train resistance is 30N/tonne, rotational inertia effect 10% and combined efficiency of transmission, motor and power modulator is 85%  
 Determine a) Average speed and b) Specific energy consumption
- Q6** Describe the drives used in paper mills. Outline the uses and advantages of using microprocessor in controlling the drive characteristic in such mills with relevant control block diagram. (16)

Registration No:

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REL5C001

5<sup>th</sup> Semester Regular/ Back Examination: 2023-24  
SUBJECT: Electric Power Transmission and Distribution  
BRANCH(S): EEE, ELECTRICAL

Time: 3 Hour

Max Marks: 100

Q.Code: N311

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 × 10)

- Why electrical power preferably to be transmitted at higher voltage?
- Explain why ground wire is placed at the top of the pole.
- State the importance of heavy water in nuclear power generation.
- What are the factors which affect sag in overhead transmission line?
- What is the difference between transmission line and feeder?
- Draw the phasor diagram of the nominal T- model of a medium transmission line.
- What are the various types of substations? Write in brief about each.
- Define ACSR cable and state its advantages.
- Define surge impedance loading.
- Identify the type of fault if the positive sequence component of voltage at the point of fault is zero. Justify the reason.

Part-II

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

- Write a short note on- Thermal Power Generation.
- A 3-phase transmission line is being supported by three disc insulators. The potentials across top unit (i.e., near to the tower) and middle unit are 8 kV and 11 kV respectively. Calculate
  - The ratio of capacitance between pin and earth to the self-capacitance of each unit.
  - The line voltage
  - String efficiency
- Derive the expression for the capacitance of three phase unsymmetrical spaced transposed overhead transmission line.
- A transmission line has a span of 200 meters between level supports. The conductor has a cross-sectional area of  $1.29 \text{ cm}^2$ , weighs  $1170 \text{ kg/km}$  and has a breaking stress of  $4218 \text{ kg/cm}^2$ . Calculate the sag for a safety factor of 5, allowing a wind pressure of  $122 \text{ kg per square metre}$  of projected area. What is the vertical sag?



- e) Explain clearly the Ferranti effect with a phasor diagram.
- f) Describe string efficiency and the methods to improve it in detail.
- g) A 3-phase line having an impedance of  $(5 + j20)$  ohm per phase delivers a load of 30 MW at a p.f. of 0.8 lag and voltage 33 kV. Determine the capacity of the phase modifier required to be installed at the receiving end if the voltage at the sending end is to be maintained at 33 kV.
- h) Describe any one of the methods of improving the string efficiency.
- i) Explain advantages and disadvantages of bundled conductors.
- j) Describe medium transmission line with phasor diagram using end condenser model.
- k) What is Kelvin's law and what are its limitations?
- l) The voltages across a 3-phase unbalanced load are  $V_a = 300$  V,  $V_b = 300 \angle -90^\circ$  V and  $V_c = 800 \angle 143.1^\circ$  V respectively. Determine the sequence components of voltages. Phase sequence is abc.

### Part-III

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

- Q3 a) What do you mean by fault in power system? What do you mean by balanced and unbalanced fault? What is a sequence network? Represent transformer, generator and transmission line in sequence network form. (8)
- b) Determine the conditions for maximum and zero voltage regulation for a short transmission line. (8)
- Q4 Using the distributed parameter form of transmission line model obtain the equation for  $V_s$  and  $I_s$  in term of  $V_R$ ,  $I_R$ , line resistance/Km,  $r$ , line inductance/Km,  $L$ , conductance/Km,  $g$ , capacitance/Km,  $C$ , propagation constant,  $\gamma$  and characteristics Impedance,  $Z_c$ . (16)
- Q5 a) What is meant by the disruptive critical voltage and visual critical voltage? State the effects of conductor spacing and condition of the surface of conductors on these voltages. (6)
- b) Derive an expression for Sag of a line supported between two supports of same height. (5)
- c) A three-phase overhead line is designed with an equilateral spacing of 450cm with a conductor diameter of 1.2 cm. If the line is constructed with horizontal spacing with suitable transposed conductors. Find the spacing between adjacent conductors which would give the same value of inductance as in the equilateral arrangement. (5)
- Q6 a) What are Soil Resistivity and Earth Resistance? Discuss its importance in power system earthing. (10)
- b) Discuss about single-wire earth return concept in distribution system. (6)

Registration No:

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REL5D001

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Electrical Machine Design

BRANCH(S): Electrical

Time: 3 Hour

Max Marks: 100

Q.Code: N329

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)

- Write down the function of the breather.
- In an induction motor, the rotor input is 1000 W and slip is 4%. What is the value of the rotor copper loss?
- What is the function of the damper winding?
- Why are you skewing the rotor slots in the induction motor?
- How to choose the armature slots for synchronous machines?
- Which type of transformer sandwich winding is used?
- How to choose the number of poles in the DC machine?
- Compare the difference between single- and double-layer winding of synchronous machines.
- What is the most suitable material used for the transformer core?
- A transformer is working at its maximum efficiency. Its iron loss is 1000 W. Find the copper loss.

**Part-II**

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

- Compare the difference between core-type and shell-type transformers.
- Find the minimum number of poles for a 120 KW generator if the average voltage between commutator segments is not to exceed 15 and the armature mmf per pole is not to exceed 10,000 A.
- Discuss the various steps to design the rotor of a squirrel cage induction motor.
- Justify the reasons for the tappings are provided on the high voltage winding of the transformer.
- Give the winding details for a 4 pole, 36 slots, and 72 segment d.c. armature with 8 parallel paths.

- f) Find the main dimensions of a 200 KW, 250 V, 6 pole, 1000 r.p.m. generator. The maximum value of flux density in the gap is  $0.87 \text{ wb/m}^2$  and the ampere conductors per meter of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percent. Assume the ratio of the length of the core to pole pitch = 0.75.
- g) Explain the effect of SCR on the synchronous machine performance.
- h) Write notes on the classification of insulating material.
- i) Calculate the diameter and length of armature for a 7.5 KW, 4pole, 1000 r.p.m. 220 V shunt motor. Given: full load efficiency = 0.83; maximum gap flux density =  $0.9 \text{ Wb/m}^2$ ; specific electric loading = 30,000 armature conductors per meter; field form factor = 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5% of the rated current. The pole face is square.
- j) How does the length of the airgap greatly influence the performance of the synchronous machine?
- k) Explain the advantage of the bar winding as compared with winding with multi-turn coils in the synchronous machine.
- l) Describe the types of cooling used in transformers.

### Part-III

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

- Q3 Find the main dimensions of a 2500 KVA, 187.5 r.p.m., 50 Hz, 3 phase, 3 K.V., salient pole synchronous generator. The generator is to be a vertical, water-wheel type. The specific magnetic loading is  $0.6 \text{ Wb/m}^2$  and the specific electric loading is 34000 A/m. Use circular poles with the ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the run-away speed is about 2 times the normal speed. (16)
- Q4 Determine suitable stator dimensions for a 500 KVA, 50 Hz, 3 phase alternator to run at 375 rpm. Take mean gap density over the pole pitch as  $0.55 \text{ wb/m}^2$ , the specific electric loading as 25000 A/m. The peripheral speed should not exceed 35 m/s (16)
- Q5 Design a suitable commutator for a 350 KW, 600 r.p.m., 440V, 6 pole d.c. generator having an armature diameter of 0.75 m. The number of coils is 288. Assume suitable values wherever necessary (16)
- Q6 A 3 phase, 50 Hz, oil cooled core type transformer has the following dimensions. distance between core centers = 0.2m, height of window = 0.24 m; diameter of circumscribing circle = 0.14m. The flux density in the core is  $1.25 \text{ wb/m}^2$  and current density in the conductors is  $2.5 \text{ A/mm}^2$ . Estimate the KVA rating. Assume a window space factor of 0.2 and a core area factor = 0.56. The core is 2 stepped. (16)



5<sup>th</sup> Semester Regular/Back Examination: 2023-24

**SUBJECT: Electrical Machines-II**

BRANCH(S): EEE,ELECTRICAL

Time: 3 Hour

Max Marks: 100

Q. Code: N240

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)

- What is rotating magnetic field?
- Why short-pitch winding is preferred over full pitch winding?
- Define winding factor.
- A slip-ring induction motor runs at 290 r.p.m. at full load, when connected to 50Hz supply. The synchronous speed is 375 r.p.m. Determine the number of poles and slip.
- Define crawling and cogging of three phase induction motor.
- Why is single phase induction motor not self starting?
- Discuss few differences between single phase and three phase induction motors.
- What do you mean by armature reaction of a three phase alternator?
- An 8-pole synchronous generator is running at 750 rpm. What is the frequency? At what speed must the generator be run so that frequency shall be 25 Hz?
- Draw the V-curve and inverted V-curve at different loading conditions.

## Part-II

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

- Define the pitch factor and distribution factor and their significance in synchronous machine.
- Explain in detail the distributed and concentrated windings and how the performance of the machine can get affected by the windings construction.
- Explain the principle of operation of a 3-phase induction motor with relevant diagrams.
- A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50Hz. Calculate:
  - The speed at which the magnetic field of the stator is rotating
  - The speed of the rotor when the slip is 0.04.
  - The frequency of the rotor currents at standstill.
  - The frequency of the rotor currents when the slip is 0.03.

- e) What do you mean by forward slip and backward slip in single-phase induction motor? Draw the torque- speed characteristics of single phase induction motor.
- f) What are the different methods of speed control of three phase induction motor?
- g) A 4-pole, 50Hz star-connected alternator has a flux per pole of 0.12Wb. It has 4 slots per pole per phase, conductors per slot being 4. If the winding coil span is 150 degree, find the EMF.
- h) What do you mean by OCC and SCC of an alternator? Find the parameters from OCC and SCC with the required circuit diagram.
- i) A 3-phase star connected alternator is rated at 100 kVA. On a short-circuit a field current of 50 amp gives the full load current. The EMF generated on open circuit with the same field current is 1575 V/phase. Calculate the voltage regulation at 0.8 power factor lagging. Assume armature resistance is 1.5 ohm.
- j) Draw and explain the Power vs Load angle characteristics of cylindrical alternator?
- k) Discuss the two reaction theory applicable to salient pole synchronous machine.
- l) Justify, synchronous motor is not self starting. Explain the method of starting of synchronous motor.

### Part-III

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

- Q3 Explain the torque slip characteristic of 3-phase induction motor. Derive the condition for maximum torque for an induction motor. (16)
- Q4 A 3-phase, 4-pole, 50 Hz, induction motor has a star connected wound rotor. The rotor emf is 50V between the slip rings at standstill. The rotor resistance and standstill reactance are 0.4 ohm and 2.0 ohm respectively. Calculate, (16)
  - (i) rotor current per phase at starting when slip rings are short circuited
  - (ii) Rotor current per phase at starting if 50 ohm per phase resistance is connected between slip rings.
  - (iii) Rotor EMF when the motor is running at full load at 1440 rpm
  - (iv) Rotor current at full load and
  - (v) Rotor power factor at full load
- Q5 Why are the single phase induction motor not self starting? How these can be made self starting? What are different types of Starting methods for single phase induction motor? Explain. (16)
- Q6 Discuss and state the conditions necessary for paralleling alternators. Describe in detail the full process of synchronization of three phase alternator using dark lamp method. (16)

Registration No:

Total Number of Pages: 03

Course: BTECH  
Sub. Code: RCS5C001

5<sup>th</sup> Semester Regular/Back Examination: 2023-24  
SUBJECT: Formal Languages and Automata Theory  
BRANCH(S): CSE/CSEAIME/CSIT/CST/Electrical&C.E, Electronics&C.E/IT

Time: 3 Hour  
Max Marks: 100  
Q.Code: N330

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)

- Construct a Deterministic Finite Automata (DFA) for  $L = \{\text{set of all strings where the number of 'a' and the number of 'b' in the string is even}\}$  over  $\Sigma = \{a, b\}$
- Classify different types of Turing Machine.
- Write regular expression that represents the language of all strings over  $\{0, 1\}$  which ends with either 0 or 11.
- Consider the grammar  $G$ , where the productions are

$E \rightarrow F - E \mid E - F \mid F$

$F \rightarrow a \mid b$

Prove that the Grammar is ambiguous for the string  $a - b$ .

- Construct the grammar to derive the language  $L = \{wcw' \mid w \in \{a, b\}^* \text{ and } w' \text{ is reverse of string } w\}$
- Differentiate between Chomsky Normal Form (CNF) and Greibach Normal Form (GNF).
- State the halting problem of Turing machine.
- Can a context-free grammar generate an infinite language? Justify your answer.
- Define K-Clique problem. State whether the problem belongs to Class P or Class NP.
- Differentiate between recursive and recursively enumerable language.

Part-II

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

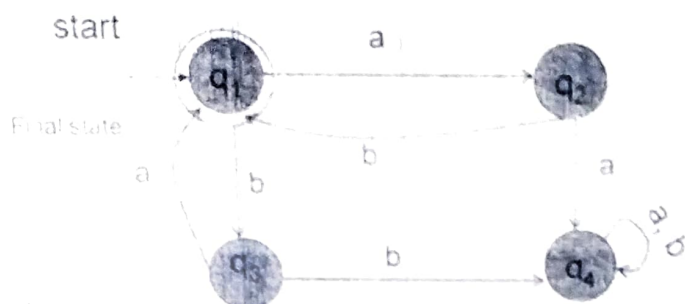
- Construct a DFA for  $L = \{\text{set of all strings where the number of 'a' in the string is at least 2}\}$  over  $\Sigma = \{a, b\}$ . NFA is more powerful than DFA. State true or false. Justify your answer.
- Construct  $\epsilon$ -NFA for the regular expression  $R = (cd \mid c)^*$ . Construct the equivalent DFA by  $\epsilon$ -closure method for the given regular expression.



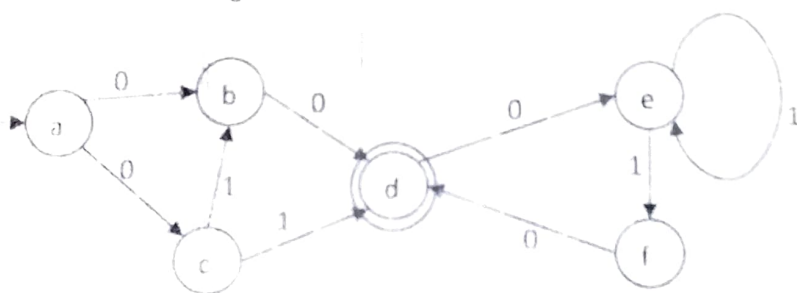
- c) Construct a minimum state automaton equivalent to given automaton whose transition table is given below

States/Input	a	b
$\rightarrow q_0$	q1	q3
q1	q2	q4
q2	q1	q4
q3	q2	q4
*q4	q4	q4

- d) State Arden's Lemma and find the regular expression corresponding to the automaton given below



- e) Use pumping lemma to prove that the language  $L = \{a^p | p \text{ is a prime}\}$  is not regular  
 f) Compare Deterministic and Non deterministic PDA. Is it true that non deterministic PDA is more powerful than that of deterministic PDA? Justify your answer.  
 g) List the main application of pumping Lemma in CFL's  
 h) Compare and contrast the Moore machine and Mealy machine models of finite state machines. Provide five distinct points of comparison.  
 i) Convert the following NFA to DFA.



- j) Define Ackermann's function. Using the function, find out the values of  $A(2, 1)$  and  $A(2, 2)$ .  
 k) Show that the following functions are primitive recursive  
 I.  $f(x, y) = x * y$   
 II.  $f(x, y) = x^y$   
 l) Differentiate between P and NP class of problems.

### Part-III

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

- Q3 a) Explain the Chomsky hierarchy of languages, including the four types of languages and their associated grammars (8)
- b) List out the identities of Regular Expressions. Apply the identities of regular expressions to prove the following:  $(1+00^*1)^+(1+00^*1)(0+10^*1)^*(0+10^*1) = 0^*1(0+10^*1)^*$ . (8)
- Q4 a) Design a Push Down Automata (PDA) accepting the language  $L = \{0^n1^m0^n \mid m, n \geq 1\}$ . (8)
- b) Convert the following Language to Chomsky Normal Form (CNF), (8)
- $$S \rightarrow abSb \mid aAb \mid a$$
- $$A \rightarrow bS \mid aAab$$
- Q5 a) Discuss variants of Turing Machine. Design a Turing Machine that will accept the language  $L = \{0^n1^n \mid n \geq 1\}$ . (8)
- b) Differentiate between recursive language and recursively enumerable language. Prove that recursive languages are closed under Union, Complement. (8)
- Q6 a) Show the relationship between NP-Complete and NP-Hard problems. Prove that Class P problems are closed under Union, Complement. (8)
- b) Explain the meaning of polynomial time reduction. Prove that if B is in P and  $A \leq_p B$ , then A is in P. (8)

Registration No:

Total Number of Pages: 02

Course: B.Tech  
Sub Code: RC15C003

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Geotechnical Engineering

BRANCH(S): C&EE, CIVIL

Time: 3 Hour

Max Marks: 100

Q.Code: N241

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)**

- What are the index properties of soil? Why are they important?
- Distinguish between Residual and Transported soil.
- What is a zero air voids line? Draw a compaction curve and show the zero air voids line
- What are the assumptions made in Terzaghi's one dimensional consolidation theory?
- What is a pressure bulb?
- What is meant by total stress, neutral stress and effective stress?
- Differentiate between 'Compaction' and 'Consolidation'.
- What are the methods available for determination of permeability in the laboratory?
- What is quick sand condition?
- Define normally consolidated clays and over consolidated clays.

**Part-II**

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

- Write the major soil classifications as per Indian Standard Classification System.
- The mass of wet soil when compacted in a mould was 19.55 kN. The water content of the soil was 16%. If the volume of the mould was  $0.95 \text{ m}^3$ . Determine (i) dry unit weight, (ii) Void ratio, (iii) degree of saturation and (iv) percent air voids. Take  $G = 2.68$ .
- The water table in a deposit of sand 8 m thick is at a depth of 3 m below the ground surface. The bulk density of sand is  $19.62 \text{ kN/m}^3$ . Calculate the effective pressure at 1m, 3m and 8m below the ground surface.
- Write notes on: (a) Thixotropy; (b) Capillary siphoning.
- A falling head permeability test was carried out on silty clay using a standard permeameter having a sample of 12.7 cm long. The diameter of the sample and the standpipes were 10 cm and 1.0 cm respectively. The water level in the standpipe was observed to fall from 100 cm to 60 cm in 20 minutes. Determine the coefficient of permeability of the soil and height of water level in the standpipe after another 20 minutes.



- f) State and explain Darcy's law.
- g) What are the applications of flow net and explain briefly?
- h) A concentrated point load of 200 kN acts at the ground surface. Find the intensity of vertical pressure at a depth of 10 meters below the ground surface, and situated on the axis of the loading. What will be the vertical pressure at a point at a depth of 5 m and at a radial distance of 2 m from the axis of loading? Use Boussinesq analysis.
- i) Differentiate standard proctor from modified proctor test.
- j) Discuss the effect of compaction on various engineering properties of soils.
- k) What are the types of tests conducted in triaxial test apparatus based on drainage condition?
- l) What are different components of settlement? Explain in detail.

### Part-III

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

- Q3 a) Draw the diagram for the three Atterberg Limits of a soil and mark the various soil phases. (8)
- b) Find the average horizontal and vertical permeability of a soil mass made up of three horizontal layers. The first and second layer have same thickness of 0.6 m each and third layer is 0.8 m thick. The coefficient of permeability of first, second and third layer are  $2 \times 10^{-4}$  cm/s,  $2.5 \times 10^{-5}$  cm/s and  $1.2 \times 10^{-4}$  cm/s respectively. (8)

- Q4 a) Discuss factors affecting compaction. (8)
- b) A laboratory compaction test conducted on a sample of soil gave the following results: (8)

Mass of wet soil (kg)	1.7	1.89	2.03	1.99	1.96	1.92
Moisture content (%)	7.7	11.5	14.6	17.5	19.7	21.2

Find maximum dry density and optimum moisture content. Also, plot the zero air void line. (specific gravity of soil = 2.7, Volume of mould = 1000 cc)

- Q5 a) Discuss Newmark's chart and its application in details. (8)
- b) The Triaxial tests conducted on four identical soil sample specimens gave the following results. (8)

Cell pressure in $\text{kN/m}^2$	100	150	200	250
Deviator stress in $\text{kN/m}^2$	300	420	515	607

Determine the shear parameters.

- Q6 a) What are the advantages and disadvantages of direct shear test? (8)
- b) In a laboratory consolidometer test on a 20 mm thick sample of saturated clay taken from a site, 50% consolidation point was reached in 10 minutes. Estimate the time required for the clay layer of 5 m thickness at the site for 50% compression if there is drainage only towards the top. What is the time required for the clay layer to reach 50% consolidation if the layer has double drainage instead of single drainage. (8)

Registration No:

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Total Number of Pages: 03

Course: B.TECH  
Sub\_Code: PME51102

5<sup>th</sup> Semester Back Examination: 2023-24

SUBJECT: HEAT TRANSFER

BRANCH(S): MECHANICAL

Time: 3 Hour

Max Marks: 100

Q.Code : N242

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)

- What is the difference between heat transfer and thermodynamics?
- Write the conduction resistance expressions for a plane wall, hollow cylinder, and hollow sphere.
- For solving two-dimensional unsteady state heat conduction in a solid, how many initial and boundary conditions are required?
- Define fin efficiency and fin effectiveness.
- Define Biot number and explain its physical significance.
- What do you mean by velocity and thermal boundary layers on a flat plate?
- Define Prandtl number and explain its physical significance.
- Define Grashof number and explain its physical significance.
- State Wien's displacement law.
- Define Log Mean Temperature Difference for heat exchangers.

**Part-II**

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

- Derive the heat conduction equation in cartesian coordinates using an elemental volume for a stationary, isotropic solid.
- A plastic panel of area  $A = 0.093 \text{ m}^2$  and thickness  $L = 0.64 \text{ cm}$  is found to conduct heat at the rate of  $3 \text{ W}$  at steady state with temperatures  $T_1 = 26^\circ\text{C}$  and  $T_2 = 24^\circ\text{C}$  on the left and right surfaces, respectively. What is the thermal conductivity of the plastic at  $25^\circ\text{C}$ ?
- A plane wall of  $50 \text{ cm}$  thickness is constructed from a material of thermal conductivity bearing a relation with temperature as  $k = 1 + 0.0015T$ , where  $T$  is in  $^\circ\text{C}$  and  $k$  in  $\text{W/mK}$ . Calculate the rate of heat transfer through this wall per unit area if one side of the wall is maintained at  $1000^\circ\text{C}$  and the other at  $0^\circ\text{C}$ . Assume steady-state conditions.

- d) The inside and outside surfaces of a hollow sphere of radii  $r_1$  and  $r_2$  are maintained at uniform temperatures of  $T_1$  and  $T_2$  respectively. The thermal conductivity of spherical material varies as

$$k = k_1 + (k_2 - k_1) \left[ \frac{T - T_1}{T_2 - T_1} \right] \text{ W/mK}$$

Where  $T$  is in  $^{\circ}\text{C}$ . Derive an expression for rate of heat transfer through hollow sphere.

- e) Two long rods of the same diameter, one made of brass ( $k = 85 \text{ W/m.K}$ ) and the other made of copper ( $k = 375 \text{ W/m.K}$ ) have one of their ends inserted into a furnace. Both the rods are exposed to same environment. At a distance of 105 mm away from the furnace, the temperature of brass rod is  $120^{\circ}\text{C}$ . At what distance from the furnace, the same temperature would be reached in the copper rod?
- f) It is better to use 10 fins of 5 cm length than 5 fins of 10 cm length. State and prove corrections of the statement. Take properties as follows:  
Diameter of fin = 10 mm.  
Thermal conductivity =  $45 \text{ W/mK}$   
Heat Transfer coefficient =  $95 \text{ W/m}^2\text{K}$
- g) A flat plate 1 m wide and 1.5 m long is maintained at  $90^{\circ}\text{C}$  in air with free stream temperature of  $10^{\circ}\text{C}$  flowing along 1.5 m side of the plate. Determine the velocity of the air required to have a rate of energy dissipation as 3.75 kW.  
Take properties of air:  
 $\rho = 1.087 \text{ kg/m}^3$ ,  $\mu = 2.029 \times 10^{-5} \text{ kg/ms}$ ,  $k_f = 0.028 \text{ W/mK}$ ,  $\text{Pr} = 0.7$
- h) A vertical plate 0.5 m high and 1 m wide is maintained at uniform temperature of  $124^{\circ}\text{C}$ . It is exposed to ambient air at  $30^{\circ}\text{C}$ . Calculate the heat transfer rate from the plate.  
Take properties of air:  
 $\nu = 2.076 \times 10^{-5} \text{ m}^2/\text{s}$ ,  $\text{Pr} = 0.697$ ,  $k_{\text{air}} = 0.03 \text{ W/mK}$
- i) Consider a circular disc of diameter  $D$  and area  $A_j$  above a plane surface of area  $A_i$  ( $\ll A_j$ ). The surfaces are parallel to each other; and  $A_i$  is located at a distance  $L$  from the center of  $A_j$ . Obtain an expression for the view factor  $F_{ij}$ .
- j) Calculate the view factor between two opposite sides of a hollow cube, if view factor between two adjacent sides of it is 0.2.
- k) Derive an expression for log mean temperature difference of parallel flow heat exchanger. How this expression can be modified for counter flow heat exchanger.
- l) In a counter flow double pipe heat exchanger, water is heated from  $40^{\circ}\text{C}$  to  $80^{\circ}\text{C}$  with oil entering at  $105^{\circ}\text{C}$  and leaving at  $70^{\circ}\text{C}$ . Taking the overall heat transfer coefficient as  $300 \text{ W/m}^2\text{K}$  and the water flow rate as  $0.1 \text{ kg/s}$ . Calculate the heat exchanger area.



### Part-III

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

- Q3 Obtain an expression for the efficiency of a 1D straight fin with convective tip. Assume same heat transfer coefficients at the tip and over the periphery. (16)
- Q4 Assuming linear velocity and temperature profiles, carry out the integral analysis of the thermal boundary layer on an isothermal flat plate for  $Pr \geq 1$  and obtain an expression for the local Nusselt number as a function of Reynolds number and Prandtl number. For linear velocity profile:  $(\delta/x) * (Re_x)^{1/2} = 3.46$  (16)
- Q5 Consider two large, opposed parallel plates, one at  $T_1 = 400^\circ\text{C}$  with emissivity  $\varepsilon_1 = 0.8$  and the other at  $300^\circ\text{C}$  with emissivity  $\varepsilon_2 = 0.4$ . An aluminum radiation shield with emissivity  $\varepsilon_3 = 0.05$  is placed between the plates. Compare heat transfer rates with and without the radiation shield. (16)
- Q6 If  $(\dot{m}C_p)_{\text{hot}} = (\dot{m}C_p)_{\text{cold}}$ , prove that (16)
- (a) for parallel flow:  $\varepsilon = \frac{1 - \exp(-2 \text{ NTU})}{2}$
- (b) for counter flow:  $\varepsilon = \frac{\text{NTU}}{1 + \text{NTU}}$

Registration No:

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Total Number of Pages: 02

B.Tech  
RME5C002

5<sup>th</sup> Semester Regular / Back Examination: 2023-24

Mechanisms and Machines

BRANCH(S): MECH, MMEAM

Time: 3 Hour

Max Marks: 100

Q.Code: N346

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

(2 x 10)

Q1 Answer the following questions:

- What is the condition for correct steering?
- What is a Cam and Follower?
- What is the function of a flywheel?
- Write the expression for module (m) of a gear in terms of number of teeth (T) and pitch circle diameter (D).
- State the different types of governors.
- Define the terms "Interference" and "Undercutting" as applied to Gears.
- What do you understand by gyroscopic couple?
- Why is balancing of rotating parts necessary for high speed engines?
- Define, in short, free and forced vibrations.
- What do you understand by transmissibility?

Part-II

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

- Sketch and show the two main types of steering gears and discuss their relative advantages.
- Explain with sketches the different types of cams and followers.
- Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels.
- Draw the turning moment diagram of a single cylinder double acting steam engine.
- The number of teeth in gears 1 and 2 are 60 and 40; module = 3 mm; pressure angle =  $20^\circ$  and addendum = 0.318 of the circular pitch. Determine the velocity of sliding when the contact is at the tip of the teeth of gear 2 and the gear 2 rotates at 800 r.p.m.

- f) A Porter governor has two balls each of mass 3 kg and a central load of mass 15 kg. The arms are all 200 mm long, pivoted on the axis. If the maximum and minimum radii of rotation of the balls are 160 mm and 120 mm respectively, find the range of speed.
- g) Define and explain the following terms relating to governors.  
a) Stability, b) Sensitiveness, c) Isochronism, and d) Hunting.
- h) What will be the effect of the gyroscopic couple on a disc fixed at a certain angle to a rotating shaft?
- i) How the different masses rotating in different planes are balanced? Explain.
- j) Explain the terms 'under damping, critical damping' and 'over damping'.
- k) A beam of length 10 m carries two loads of mass 200 kg at distances of 3 m from each end together with a central load of mass 1000 kg. Calculate the frequency of transverse vibrations. Neglect the mass of the beam and take  $I = 10^9 \text{ mm}^4$  and  $E = 205 \times 10^3 \text{ N/mm}^2$ .
- l) Explain the term 'Logarithmic decrement' as applied to damped vibrations.

### Part-III

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

- Q3 A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion: (16)  
(a) Follower to move outwards through a distance of 30 mm during  $120^\circ$  of cam rotation;  
(b) Follower to dwell for  $60^\circ$  of cam rotation;  
(c) Follower to return to its initial position during  $90^\circ$  of cam rotation; and  
(d) Follower to dwell for the remaining  $90^\circ$  of cam rotation.  
The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.
- Q4 State the law of gearing. Derive an expression for the length of the arc of contact in a pair of meshed spur gears. (16)
- Q5 Explain the term height of the governor. Derive an expression for the height in the case of a Watt governor. What are the limitations of a Watt governor? (16)
- Q6 The following data refer to two-cylinder locomotive with cranks at  $90^\circ$ : (16)  
Reciprocating mass per cylinder = 300 kg; Crank radius = 0.3 m; Driving wheel diameter = 1.8 m; Distance between cylinder centre lines = 0.65 m; Distance between the driving wheel central planes = 1.55 m. Determine:  
a) the fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 km.p.h.;  
b) the variation in tractive effort; and  
c) the maximum swaying couple.



Registration No:

Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REC5C003

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Microprocessors & Microcontrollers

BRANCH(S): ECE, ETC

Time: 3 Hour

Max Marks: 100

Q.Code: N243

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)

- Mention different operating modes of 80286/386 processor.
- Mention the interrupt priorities of 8086.
- What is the need for system clock and how it is generated in 8085?
- Mention the valid register pairs of 8085.
- Explain DJNZ instruction of Intel 8051 microcontroller?
- In maximum mode, what is the operation of S0, S1 and S2 pins in 8086 microprocessors?
- Write the size of physical memory and virtual memory of 8086 microprocessor.
- Write 8051 instructions that always clear the carry flag.
- What is ALE? Mention the purpose of ALE in 8085.
- Mention the need for a co-processor.

Part-II

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

- Write an assembly language program for multiplying two 8-bit numbers in 8085 microprocessor.
- Draw a circuit diagram to interface a keyboard and a seven segment LED using 8279.
- How does the timer operate in 8051 in mode 2? Explain with suitable schematics.
- Explain the following assembler directive in 8086  
i) ASSUME ii) EQU iii) DW iv) DD
- Explain the addressing capabilities of 8086.
- Discuss the internal memory organization of 8051 microcontroller.
- Explain the bus interface unit and execution unit of 8086 microprocessor.
- Explain architecture of 80386 with diagram.
- Briefly explain handshaking or polling with necessary diagrams.

- j) Show the control word format of 8255 and explain how each bit is programmed.
- k) Draw the timing diagram of MOV A, M instruction and explain each machine cycle.
- l) Design a system using 8051 to blink four LEDs.

### Part-III

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

- |    |  |      |
|----|--|------|
| Q3 | Explain in detail about the system bus timing of 8086.   | (16) |
| Q4 | With suitable examples explain the addressing modes and instruction sets of 8051.                  | (16) |
| Q5 | Explain with a neat diagram the interfacing of stepper motor to 8086 using 8255 in Detail.         | (16) |
| Q6 | Explain in details and with necessary sketch, how to convert an analog signal into digital signal. | (16) |

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RCS5C003

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Operating Systems

BRANCH(S): CSE, CSEAI, CSEAIME, CSIT, CST, ELECTRICAL & C.E, ELECTRONICS & C.E, IT

Time: 3 Hour

Max Marks: 100

Q.Code: N244

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

The figures in the right hand margin indicate marks.

Part-I

- Q1 Answer the following questions: (2 x 10)
- a) What is the function of system calls in operating systems?
  - b) Define a Virtual Machine in the context of an OS.
  - c) What are threads in operating systems?
  - d) Explain the concept of Process Coordination.
  - e) Describe the role of Semaphores in synchronization.
  - f) What is a deadlock, and how can it affect a system?
  - g) Define contiguous memory allocation.
  - h) What is demand paging?
  - i) Explain the concept of Disk Scheduling.
  - j) What is the significance of system protection in an OS?

Part-II

- Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- a) Discuss the various types of operating systems and their functions.
  - b) Describe the process scheduling mechanisms in OS.
  - c) Elaborate on the different synchronization techniques used in OS.
  - d) Explain the methods for handling deadlocks in an OS.
  - e) Describe the memory management strategies in OS.
  - f) Discuss the page placement and replacement policies in virtual memory.
  - g) Explain the basic concepts of file system design and implementation.
  - h) Discuss the case study of Linux file systems as mentioned in the syllabus.
  - i) Describe the structure of Mass Storage in an OS.
  - j) Explain I/O systems in the context of operating systems.
  - k) Detail the concepts of Distributed Systems in an OS.
  - l) Explain the synchronization mechanisms in distributed operating systems.



### Part-III

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

Q3 Consider the following set of processes with the length of the CPU burst given in milliseconds: (16)

Process	Arrival Time	Burst Time	Priority
P1	0 ms	10 ms	3
P2	1 ms	1 ms	1
P3	2 ms	2 ms	3
P4	3 ms	1 ms	4
P5	4 ms	5 ms	2

- Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, Preemptive SJF, Preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 2 ms).
- What is the turnaround time of each process for each of the scheduling algorithms in part (a)?
- What is the waiting time of each process for each of these scheduling algorithms?

Which of the algorithms results in the minimum average waiting time (over all processes)?

Q4 Explain the design, implementation, and security concerns in file systems, with a case study on Linux file systems. (16)

Q5 Discuss in detail the memory management strategies, including contiguous and non-contiguous allocation, and virtual memory management. (16)

Q6 Consider the following snapshot of a system: (16)

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	4	3	0
P1	1	1	0	0	1	7	5	0				
P2	1	3	4	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using the banker's algorithm:

a. What is the content of the maximum Need?

b. Is the system in a safe state?

If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

Registration No:

Total Number of Pages: 02

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Sub\_Code: PEL5H001/PEE5H001/PME5J101 Course: B.Tech

5<sup>th</sup> Semester Back Examination: 2023-24

SUBJECT: Optimization Engineering

BRANCH(S): EEE, Electrical, MECH

Time: 3 Hour

Max Marks: 100

Q.Code: N214

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:**

- a) Write two importance of duality in mathematical programming problems. (2 x 10)
- b) Write the general form of Linear Programming Problems (LPP).
- c) When does the simple method indicate that the linear programming problem has unbounded solution?
- d) Give the mathematical formulation of an assignment problem.
- e) Discuss the existence of feasible solution of a transportation problem.
- f) Explain Lagrange multiplier with an example.
- g) Write first ten Fibonacci numbers.
- h) What is the difference between constrained and unconstrained optimization problems?
- i) Explain about queue discipline.
- j) Write two limitations of Queueing Theory.

**Part-II**

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

- a) Use Vogel's approximation method find the initial basic feasible solution for the following transportation problem:

	D	E	F	G	
A	11	13	17	14	250
B	16	18	14	10	300 Available
C	21	24	13	10	400
	200	225	275	250	

Demand

- b) Rolls of paper having a fixed length and width of 180 cm are being manufactured by a paper mill. These rolls have to be cut to satisfy the following demand:

Width:	80cm	45cm	27cm
No. of rolls:	200	120	130

Obtain the linear programming formulation of the problem to determine the cutting pattern. So that the demand is satisfied and wastage of paper is minimum.

- c) Solve the LPP  $\text{Min } z = 12x_1 + 20x_2$   
subject to  $6x_1 + 8x_2 \geq 100$ ,  $7x_1 + 12x_2 \geq 120$ ;  $x_1, x_2 \geq 0$ .
- d) Use dual simplex method to solve the LPP  $\text{Min } z = 3x + y$   
subject to  $x + y \geq 1$ ,  $2x + 3y \geq 2$ ,  $x, y \geq 0$ .
- e) What are the methods to solve an assignment problem? Which one is suitable and why?
- f) Use Branch and bound method the LPP:  $\text{Max } z = 7x_1 + 9x_2$  Subject to  $-x_1 + 3x_2 \leq 6$ ,  
 $7x_1 + x_2 \leq 35$ ,  $x_2 \leq 0$ ,  $x_1, x_2 \geq 0$ ,  $x_1, x_2$  are integers.
- g) Discuss the importance of Kuhn-Tucker conditions in nonlinear programming.
- h) Optimize  $z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$ ,  
subject to  $x_1 + x_2 + x_3 = 15$ ,  $2x_1 - x_2 + 2x_3 = 0$ .
- i) Write a short note on Golden Section Search method.
- j) Discuss the classification of queueing Models.
- k) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought-in?
- l) Explain single channel and multi channel queueing models.

### Part-III

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

Q3 What do you mean by structural changes? Consider the LPP  $\text{Max } z = 3x_1 + 5x_2$  Subject to  $x_1 \leq 4$ ,  $x_2 \leq 6$ ,  $3x_1 + 2x_2 \leq 18$ ,  $x_1, x_2 \geq 0$ . Discuss the effect on the optimality of the solution, when the objective function is changed to  $3x_1 + x_2$ . (16)

Q4 Given  $x_{13} = 50$  units,  $x_{14} = 2$  units,  $x_{21} = 55$  units,  $x_{31} = 30$  units,  $x_{32} = 35$  units and  $x_{34} = 25$  units. Is it an optimal solution to the transportation problem: (16)

	D	E	F	G	
A	6	1	9	3	70
B	11	5	2	8	55 Available units
C	10	12	4	7	90
	85	35	50	45	

Requirement units

If not, modify it to obtain a better feasible solution.

Q5 Is Beale's method better as compare to Wolfe's method? Using Beale's method Solve the nonlinear programming problem:  $\text{Min } z = 6 - 6x_1 - 2x_1x_2 + 2x_1^2 + 2x_2^2$ , subject to  $x_1 + x_2 \leq 2$ ;  $x_1, x_2 \geq 0$ . (16)

Q6 What is M/M/1 Queue Model? Write the assumptions consider in M/M/1 Queue Model. Explain M/M/1 Queue Model with a suitable example. (16)



Registration No:

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RC15D004

5<sup>th</sup> Semester Regular/Back Examination: 2023-24

SUBJECT: Railway and Airport Engineering

BRANCH(S): CIVIL

Time: 3 Hour

Max Marks: 100

Q.Code: N298

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)

- Define 'Cant Deficiency'.
- What are the advantages of coning of wheel?
- What are the criteria for deciding the length of rail?
- Why a minimum gradient is provided at station yard?
- Define adzing of sleeper.
- For a runway at an elevation of 100 mt. above M.S.L. and airport reference temperature of 19°C, Calculate the rise of temperature to be taken into account as per ICAO.
- Define: Port, Harbour, and Dock.
- Differentiate between Apron and Hanger.
- What are the functions of Air traffic control (ATC) in an air port?
- What do you mean by "Calm period"?

Part-II

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

- Mention the relative merits and demerits of Flat-Footed rail and Bull-Headed rail.
- What are the different types of surveys to be carried out for taking up new railway project? Explain final location survey.
- What is creep? Discuss the percussion theory.
- On a B.G. 3° curve, the equilibrium cant is provided for a speed of 65 kmph.
  - Calculate the value of Equilibrium Cant.
  - Calculate the value of Theoretical Cant.
  - Calculate the maximum Permissible Speed
- A curve of radius 350 m is diverges from a 4° main curve in reverse direction in the layout of M.G. yard. If the speed on branch line is restricted to 40 kmph, determine the restricted speed on the main line.

- f) Draw the schematic diagram of left hand Turn out and show its various component parts
- g) What are the requirements and characteristics of a good crossing?
- h) What are the objects of signaling? Explain the working principle of semaphore signal.
- i) What are the characteristics of Mound Breakwater?
- j) What are the requirements of a good Harbor?
- k) What are the different characteristics of Aircraft? How do they affect the planning and design of Airports?
- l) What are the imaginary surfaces? Explain briefly their significance.

### Part-III

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

- Q3** Briefly explain the different type of train resistances. A 4-10-2 locomotive is required to haul a train at a speed of 96 kmph. The train is made to run on a straight level track with an axle load of driving wheels of the engine is 22.84 tonne each. **(16)**
- i. Calculate the maximum permissible load that can be pulled by the engine
  - ii. What should be the reduction in speed, if the train has to ascend a slope of 1 in 150 with a 3° curve?
- Q4** Briefly explain various factors which influence the selecting a suitable site for a construction of a new airport. **(16)**
- Q5** Briefly explain about the airport marking and lightening. **(16)**
- Q6** Briefly explain the inland water transport in India and their classifications. **(16)**

5<sup>th</sup> Semester Regular / Back Examination 2023-24  
SUBJECT: RAPID MANUFACTURING PROCESSES

BRANCH: Mech

Time: 3 Hour

Max Marks: 100

Q.CODE: N322

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)
- What is meant by a Rapid Prototyping?
  - Distinguish between digital prototyping and virtual prototyping.
  - Which rapid manufacturing processes are best suited for tissue engineering?
  - What is bridge tooling?
  - Can rapid prototype parts be made of rubber? Discuss.
  - What is non-contact type measuring device? Give examples.
  - Briefly explain e-manufacturing using Laser sintering.
  - How does aerospace technology make use of rapid tooling applications?
  - What is reverse engineering?
  - How soft tooling is different from hard tooling?

Part-II

- Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- Differentiate between traditional prototyping and rapid prototyping.
  - Explain the evolution of RP systems indicating the history and their growth rate in the industrial sector.
  - How 'Fused Deposition Modelling' used in rapid prototyping. Mention applications of FDM models.
  - Discuss the application of rapid prototyping in medical field with examples.
  - Discuss the process principle and applications of 3-D printing.
  - What are the merits and demerits of laminated object manufacturing?
  - Explain Laser Sintering System using a diagram.
  - Briefly explain the LENS process with a neat diagram.
  - What are the solid based and powder-based materials used in rapid prototyping systems? Discuss.
  - Discuss on STL files and define slicing relevant to CAD.
  - Write short notes on 'Magic and magic communication'.
  - Describe the features of the software for RP.



### Part-III

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

- Q3 Explain Selective Laser Sintering with a neat sketch. Differentiate between SLA and SLS in Rapid prototyping. (16)
- Q4 How does a pattern differ from a prototype? Explain the effect of rapid prototyping and tooling on product development. Also explain few industrial applications of rapid manufacturing processes. (16)
- Q5 What are the factors that influence accuracy in RMP optimization? Discuss briefly. Explain data preparation errors and part building errors with suitable examples. (16)
- Q6 Discuss different CAD model creation methods in reverse engineering. What is the software that is used for making of medical models? Present a case study. (16)

Registration No:

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Total Number of Pages: 03

Course: B.Tech  
Sub\_Code: RCI5D001

5<sup>th</sup> Semester Regular / Back Examination: 2023-24

SUBJECT: Structural Analysis-II

BRANCH(S): C&EE, CIVIL

Time: 3 Hour

Max Marks: 100

Q.Code: N177

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)**

- State the difference between force method and displacement method.
- Explain the terms carry over moment and carry over factor.
- Define plastic hinge and plastic moment capacity.
- State the relationship between stiffness matrix and flexibility matrix.
- What are the main functions of stiffening girders in suspension bridges?
- Express the relative stiffness when the far end is  
(a) simply supported and (b) fixed.
- A continuous beam ACB is fixed at end A and B, hinged at C. Span length of AC is 6 m and CB is 10 m, flexural rigidity of span AC is 3 times of flexural rigidity of span CB. Find the rotation factor for members at joint C.
- What do you mean by shape factor? Estimate the value of shape factor for a triangular section.
- Write the general slope deflection equation and mention what each term represents.
- A continuous beam ACB is hinged at end A and C, fixed at B. Span length of AC is 8 m and CB is 4 m, flexural rigidity of span AC and CB are same. Find the distribution factor for members at joint C.

**Part-II**

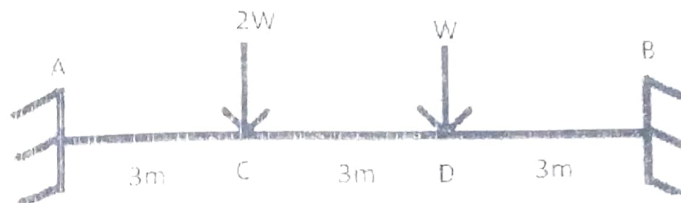
**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- A continuous beam ABC consists of spans AB and BC of lengths 6 m and 8 m respectively. The span BC carries a uniformly distributed load of 10 kN/m, while a concentrated load 60 kN acts on centre of AB. The ends A and C are fixed while B is hinged. Find the support moments assuming EI constant for all members. Use slope deflection method.
- A two hinged portal frame ABCD consist of vertical columns AB and CD 5 m height each and beam BC 10 m length. The frame carries a vertical point load of 100 kN at mid-point of beam BC. The members AB, CD and BC have same flexural rigidity. Find the support moments using moment distribution method.

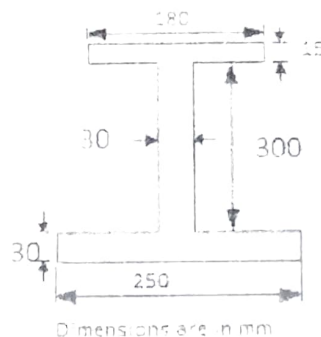
- c) A portal frame ABCD consist of vertical columns AB and CD 6 m height each and beam BC 8 m length. The frame carries uniformly distributed load 20 kN/m in the entire span of beam BC. The ends A and D are fixed. The members AB and CD have flexural rigidity  $2EI$  each and BC has flexural rigidity  $3EI$ . Find the support moments using Kani's method.

- d) A two hinged parabolic arch of span 20 m and rise 5 m carries a uniformly distributed load of 40 kN/m on left half of the span. Determine the horizontal thrust, reactions and maximum positive bending moment.

- e) Calculate the collapse load  $W$  for the fixed beam as shown in figure with plastic moment 150 kNm.  $AC = CD = DB = 3$  m.



- f) Write a short note on lower bound and upper bound theorem.
- g) Derive the sway correction factor for a single bay and single storey frame.
- h) Find the shape factor for the I section as shown in figure.



- i) State the advantages of redundant structures.
- j) A continuous beam ABC consists of spans AB and BC of lengths 5 m and 10 m respectively. The span AB carries a uniformly distributed load of 50 kN/m, while span BC carries a concentrated load of 50 kN in the middle of the span. The end A is fixed and C is simply supported. Find the support moments assuming  $EI$  constant for all spans. Use flexibility matrix method. Where  $E$  = Young's modulus of elasticity,  $I$  = moment of inertia.
- k) Define the term rotation factor as used in Kani's method and derive the expression for it.
- l) Write note on matrix stiffness method.



### Part-III

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

Q3

A two hinged parabolic arch of span 40 m and rise 6 m carries a uniformly distributed load of 30 kN/m for the left half of the span and a point load of 100 kN at 5 m from right support. Determine

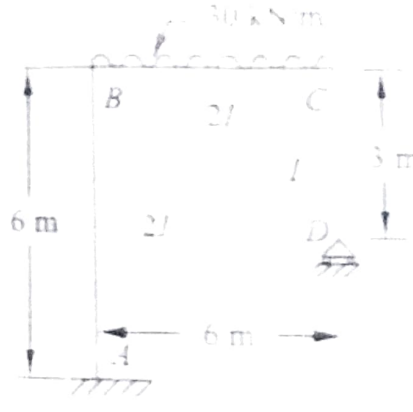
(16)

- Horizontal thrust
- Maximum positive & negative moment
- Shear force and normal thrust at a section 10 m from the left support.

Q4

Analyze the frame as shown in figure by moment distribution method. Draw the shear force and bending moment diagram.

(16)



Q5

A continuous beam ABCD consists of three spans  $AB = 6\text{ m}$ ,  $BC = 5\text{ m}$ ,  $CD = 5\text{ m}$ . Span AB is loaded with uniformly distributed load of 10 kN/m, BC is loaded with a point load of 50 kN at a distance of 3 m from B and CD with a point load of 80 kN at a distance of 2.5 m from C. Ends A and D are fixed. Determine the bending moment at the supports and plot the bending moment diagram. Assume uniform flexural rigidity for all members.

(16)

Solve the problem by slope deflection method.

Q6

A two span continuous beam AB and BC with end A is fixed and C is hinge. The length of span AB and BC are 8 m and 12 m respectively. The span AB is loaded with uniformly distributed load having intensity of 90 kN/m and the span BC carries a point load of 140 kN at the middle. Use stiffness matrix method for analysis assuming uniform flexural rigidity for AB and BC.

(16)

Registration No:

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: RC15C002

5<sup>th</sup> Semester Regular/Back Examination: 2023-24  
SUBJECT: Water and Waste Water Engineering  
BRANCH(S): C&EE, CIVIL, ENV

Time: 3 Hour

Max Marks: 100

Q.Code : N352

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)**

- Discuss different sources of water with suitable examples.
- What are the desirable limits of turbidity, total dissolved solids, iron and total hardness (as per IS 10500)?
- Differentiate between sedimentation and coagulation and flocculation.
- Write a short note on Ion Exchange.
- Elaborate on the various natural processes involved in the purification of water sources.
- The 5 day at 20°C BOD test result of a 100 times diluted waste water sample is as follows: Initial dissolved oxygen: 7.1 mg/L, Final dissolved oxygen: 2.3 mg/L. Find BOD<sub>5</sub>.
- What is the difference between temporary hardness and permanent hardness?
- Explain the factors affecting the storm water discharge.
- Discuss the working of sludge digestion tank.
- Define the term "sludge dewatering." Briefly explain two common methods used for dewatering sludge in wastewater treatment.

**Part-II**

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

- A pump is to deliver water from an underground tank against a static head of 62 m. The suction pipe is 85 m long and is of 40 cm diameter with Darcy-Weisbach friction factor  $f = 0.02$ . The delivery pipe is of 40 cm diameter, 2100 m long and  $f = 0.022$ . The pump characteristics may be expressed as  $H_p = 100 - 6000 Q^2$ . Where  $H_p$  = pump head in meters and  $Q$  = discharge in  $m^3/sec$ . Calculate the head and discharge of the pump.
- What is an 'intake structure'? Discuss the factors governing location of Intake. Enumerate the various types of intakes and discuss in brief any two of them?
- Describe the characteristics of a good disinfectant. What are the chemicals, which are used as disinfectants and discuss the advantages and disadvantages posed by each?

- d) Differentiate between slow sand filter and rapid sand filter with reference to following parameters (i) rate of filtration (ii) efficiency (iii) size (iv) method of cleaning (v) period of cleaning (vi) effective size [d<sub>10</sub>] of sand
- e) What is combined and separate system of sewerage? Discuss the relative merits of the separate and the combined systems of sewage and give the conditions favorable for the adoption of each one of them.
- f) What is the purpose of providing primary sedimentation tank in wastewater treatment? What is the expected BOD and SS removal in primary sedimentation tank? Discuss the working of it with suitable sketch.
- g) The population of a town is 10,000 and the average per capita demand is 200 L/p/d. Water is passing through a sedimentation tank which is 6 m wide, 15 m length and having a water depth of 3 m:
  - (i) Find the detention time for tank.
  - (ii) What is average flow velocity through tank?
  - (iii) Compute the overflow rate.
- h) Discuss the components of a sewerage system. Design a sewer for a maximum discharge of 650 L/s running half full. Consider Manning's rugosity coefficient  $n = 0.012$ , and gradient of sewer  $S = 0.0001$ .
- i) Explain the Hardy Cross method used for pipe network analysis in water distribution system.
- j) Explore the principles and applications of rotating biological contactors (RBCs) in wastewater treatment. Discuss its advantages and limitations.
- k) Discuss the different stages in sludge digestion process and factors affecting the process.
- l) Briefly explain the concept of anaerobic digestion. Discuss the differences between conventional anaerobic digesters and high-rate anaerobic reactors.

### Part-III

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

- Q3 Discuss sources, effects and measurement procedure for three Physical, four chemical and one biological water quality parameters. (16)
- Q4 Write a short note on the following water treatment processes: (i) Disinfection (ii) softening (iii) adsorption (iv) Aeration (4x4)
- Q5 Write a short note on the following: (i) Grit chamber (ii) Skimming tank (iii) Waste water disposal standards (iv) Methods of estimation of storm water runoff (4x4)
- Q6 What is meant by activated sludge process and trickling filter? Describe with neat sketch. Mention the advantage and disadvantage of these systems. (16)