

Roll
No.

**B. Tech.
Even Semester
2021-2022**
BAS-26 (Optimization Techniques)

Time: 2 Hrs.

Max. Marks: 30

Note: Attempt all questions.

Q.1 Attempt any three of the following questions. 1(a) is compulsory.

- (a) Optimize $f(x_1, x_2, x_3) = 3x_1^2 - 2x_2^2 + 6x_3^2 + 6x_1x_2 - 4x_2x_3 - 4x_1 + 12x_2 - 12x_3 + 10$ subject to constraints $3x_1 + 2x_2 - 4x_3 = 6$ without direct substitution. 4

- (b) Consider the following optimization problem: Maximize $f(x_1, x_2) = 2x_1 + 3x_2 - x_1^3 - 2x_2^2$ subject to $x_1 + 3x_2 \leq 6$, $5x_1 + 2x_2 \leq 10$ by method of Kuhn – Tucker conditions. Explain all cases. 3

- (c) Find the minimum of the function $f(x) = 0.5 - \frac{0.75}{1+x^2} - 0.65x \tan^{-1}\left(\frac{1}{x^2}\right)$ in the range $(-1, 6)$ by Golden section method ($n = 7$). 3

- (d) Find all extreme points of the function $f(x_1, x_2, x_3) = 5x_1^3 - 6x_2^3 + 10x_3^3 - 5x_1 + 12x_2 - 24x_3 + 5x_1^2$. Discuss the nature of two extreme points with $x_3 = \frac{\sqrt{2}}{\sqrt{5}}$. 3

Q.2 Attempt any three of the following questions. 2(a) is compulsory.

- (a) Solve the problem, **Maximize** $f = 2x_1 + 4x_2 + 3x_3$ subject to conditions 4
 $3x_1 + 4x_2 + 3x_3 \leq 3600$
 $2x_1 + x_2 + 3x_3 \leq 2400$
 $x_1 + 3x_2 + 3x_3 \leq 4800$
 $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$ by simplex method.

- (b) Minimize $Z = x_1 + 2x_2 + 3x_3$ subject to constraints 3
 $2x_1 - x_2 + x_3 \geq 4$
 $x_1 + x_2 + 2x_3 \geq 8$
 $x_2 - x_3 \geq 2$
 $x_i \geq 0, i = 1, 2, 3$.

(c)

Obtain the dual of the problem: Min $Z = 5x_1 - 2x_2 + 7x_3 - 3x_4$ subject to the 3
conditions

$$2x_1 - x_2 + 3x_3 + x_4 = 1$$

$$x_1 + x_2 - x_3 + 4x_4 = 3$$

$x_1, x_2, x_3 \geq 0$ and x_4 is unrestricted. Also explain all steps.

(d)

Solve by Karmarkar's method to the following L. P. problem: 3

Minimize $f = 4x_1 + 15x_2 - 13x_3$ Subject to

$$3x_1 - 4x_3 = 0,$$

$$x_1 + x_2 + x_3 = 1$$

$$x_i \geq 0, i=1,2,3.$$

Q.3 Attempt any three of the following questions. 3(a) is compulsory.

(a)

Solve the following Linear Programming Problem by decomposition principle' 4

Maximize $f = 7x - 9y + 5z + 8w$ subject to

$$5x + 2y + 5z + 11w \leq 20,$$

$$9y + 13z + 15w \leq 14,$$

$$5z + 2w \leq 10,$$

$$w \geq 1,$$

$$3z + 5w \leq 15,$$

$$6x + 5y \leq 30,$$

$$y \geq 5, \quad \text{and} \quad x, y, w, z \geq 0.$$

(b)

Determine the basic feasible solution by Vogel's method of the transportation 3
problem:

	A	B	C	D	Available
I	6	1	9	3	70
II	11	5	2	8	55
III	10	12	4	7	90
Required	85	35	50	45	

Also find the optimum basic feasible solution of the above transportation
problem.

(c)

Discuss the nature of two non-zero extreme points of the problem: 3

$$f = x_1^3 - 3x_1x_2^2 + 6x_2^3 + x_2^2 + \left(\frac{1}{3}\right)x_3^3 - x_2x_3^2.$$

(d)

Find the minimum of the function $f(x) = x^2 - \frac{x^3}{5} - \sin^{-1}(\sin(x))$ in the 3
range $(-1, 3)$ by Fibonacci method with taking $n = 6$. Also discuss the validity
of results.

B.Tech. (Semester IV) Even Semester**Minor Examination 2021-2022****Management Information System****Time: 2Hrs.****Max Marks: 30****Note: Attempt all Questions. Each Questions carry equal marks.****1. Attempt any 3 parts of the following: Part A is compulsory**

- (a) What are three different levels of management? Highlight the role of each management levels in the context of MIS. 4
- (b) What do you mean by management information system? Discuss its main roles. 3
- (c) How will you define the top management support system for MIS Functions? 3
- (d) Explain how an Information System supports business Organization? 3

2. Attempt any three parts of the following: Part A is compulsory

- (a) What is an Information system? Discuss about each component of an Information System. 4
- (b) Discuss the functions of management and its relevancy with MIS. 3
- (c) What are the objectives of management information system? 3
- (d) What do you mean by organizations of Management Information system? Discuss. 3

3. Attempt any two parts of the following: Part A is compulsory

- (a) What do you mean by planning for Management Information System? Explain. 4
- (b) Discuss system and user training for MIS. 3
- (c) What are the Steps of the strategic planning process? Elaborate. 3
- (d) Define budgeting. How to plan long range budget of MIS? Explain. 3

BCS-53

Roll No.

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B.Tech
(SEM-IV) EVEN SEMESTER
MINOR TEST (EXAMINATION) 2022-2023

BCS-53

Times: 2 Hrs.

Subject Name: LAMP Technology

Max Marks: 30

Note: Answer all questions.

Q.1 Attempts any three parts of the following. Q.1 (a) is compulsory

a) What do you mean by LAMP technology? Give all the consequences of using LAMP technology. 4

b) What are the kinds of permissions under Linux? How do you change permissions under Linux? 3

c) Explain all the important directories used in Linus operating system. 3

Q.2 What is Linux Distribution? Give the expiation of any two Linux distro's. 3

Attempts any two parts of the following. Q.2 (a) is compulsory

d) What is Apache web server? How it fetches the data and delivers to the user? Explain with the help of proper diagram. 4

e) Why HTTP protocol used? How it is differ from HTTPs protocol? 3

f) How tree tier web based application differ from two tier web based application? 3

g) How apache server provides security in web development? Explain the mechanism. 3

Q.3 Attempts any two parts of the following. Q.3 (a) is compulsory

h) What is shell? Which kind of shell used in Linux operating System.Explain with their properties. 4

i) How to manage user and groups in Linux Operating System? Give the example. 3

j) What is LAMP stack? Why is it being used so much in web development? 3

k) What is web browser and web server? Explain with example. 3

B TECH (II Year)

EVEN SEMESTER

Minor Examination 2021 - 2022

Computer Organization & Architecture

Time: 02 Hrs

Max. Marks: 25

Note: Attempt ALL questions. Each question carries equal Marks.

Q.1 Attempt any **Three parts** of the following. Q. 1(a) is compulsory

- a. Design Arithmetic Logic Shift unit that will perform different arithmetic, logic and shift operation. (4)
 b. Show the block diagram of the hardware that implements the following register transfer statements: (2)

$$x \ y T_2: R_2 \leftarrow R_1, R_1 \leftarrow R_2$$

c. Draw a diagram of bus system for four registers of 4-bits each. The bus is to be constructed with multiplexers. (2)

d. Represent the decimal number ± 1.75 into IEEE 754 floating point format. (2)

Q.2 Attempt any **Two parts** of the following. Q. 2(a) is compulsory

a. Write a program to evaluate the arithmetic expression: $X = A + B * (C - D / E * F)$, Using Three, Two, One and Zero address machines. (4)

b. Design a expanding opcode to allow all of the following to be encoded in a 16-bit instruction and 4-bit addresses: (2)

i. 15 Instruction with three addresses.

ii. 14 Instruction with two addresses.

iii. 31 Instruction with one addresses.

iv. 16 Instruction with zero addresses.

c. What do you understand by hardwired control unit? Give various methods to design hardwired control unit. (2)

Describe one of the design methods for hardwired control unit with suitable diagram. (2)

Q.3 Attempt any **Two parts** of the following. Q. 3(a) is compulsory

(4)

a. Design 4 bit carry look ahead generator.

b. Show the basic organization of a CPU in terms of registers and other units for a single bus data path CPU. In such a CPU, show the complete action of the CPU in fetching and executing the instruction. (2)

c. Design an arithmetic circuit with one selection variables S and two n-bit data inputs A and B. the circuit generates the following four arithmetic operations in conjunction with the input carry Cin. Draw the logic diagram for the first two stages. (2)

S	Cin= 0	Cin= 1
0	D= A+B (add)	D=A+1 (increment)
1	D=A-1 (decrement)	D=A+B+1 (Subtract)

**B TECH
EVEN SEMESTER
MINOR TEST 2021 - 2022**

Design and Analysis of Algorithms

Time: 2 Hrs.

Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

(a) (i) Consider the following fragment of code, find its asymptotic time bound: 4

for $i \leftarrow 1$ to m

```

    {
        for  $j \leftarrow 1$  to  $i$ 
        {
            set sum  $\leftarrow$  sum +  $A[i][j]$ 
        }
    }

```

$$\begin{array}{c} \sim n \\ \times h \\ \sim n^2 \end{array}$$

(ii) Consider the following recurrence

$$T(n) = 2T(n/2) + n^3$$

Find its asymptotic time bound using Master Method.

(b) Explain and write Heap-Sort algorithm. 2

Consider the following sequence of input

78, 32, 42, 62, 98, 12, 34, 83

Arrange the input sequence in ascending order using Heap-Sort algorithm.

(c) Show the red-black tree that result after inserting the keys 41, 38, 31, 12, 19, and 8 into an initially empty red-black tree 2

(d) What are the different asymptotic notations? Explain any one with suitable example. 2

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

(a) Explain the concept of Divide and Conquer method of algorithm design. You are further required to write and analyse the designed algorithm. 4

(b) Design and analyse Counting Sort algorithm. Consider the following sequence of numbers: 2

4, 2, 5, 7, 7, 3, 1, 2, 6

Use designed algorithm to arrange the numbers in ascending order

- (c). Design a Radix Sort algorithm to arrange the following sequence of numbers in ascending order: 2

Input: 478, 537, 9, 721, 3, 38, 123, 67

You are also required to analyse the designed algorithm.

Q.3 Attempt any TWO parts of the following. Q. 3(a) is compulsory.

- (a). Write an algorithm for union of two Fibonacci- Heaps. Find out the time complexity of the designed algorithm. 4
- (b). Write down all the properties of binomial trees and you are also required to give proof for each of the property. 2
- (c). Explain B-Tree with suitable example. 2

AH Step

B. Tech

(SEM - IV) EVEN SEMESTER

MINOR TEST: 2021-22

Subject: Database Management System**Time: 1 Hrs.****Max. Marks: 20****Note: Attempt all questions. Each question carries equal marks.****Q1. Attempt any three parts of the following. Question 1 (a) is compulsory.**

- (a) Draw the overall structure of database and explain its various components in brief. 4
- (b) Illustrate Generalization, Specialization and Aggregation with a suitable example. 2
- (c) Define the concept of Super Key, Candidate Key, Primary Key and Foreign Key with a suitable example. 2
- (d) Illustrate the various aggregate functions of SQL with a suitable example. 2

Q 2. Attempt any two parts of the following. Question 2 (a) is compulsory.

- (a) Describe the various database languages and their purposes associated with DBMS. 4
- (b) Bring six differences between file system and database system. 2
- (c) Describe the various responsibilities of Database Administrator. 2

Q 3. Attempt any two parts of the following. Question 3 (a) is compulsory.

- (a) Consider the following Employee database
 Employee (Employee_name, street, city)
 Works (Employee_name, company_name, salary)
 Company (Company_name, city)
 Manages (Employee_name, manager_name)
- Write SQL queries for the following:

- Find the names of all employees who work for First Bank Corporation.
- Find the names of all employees who belongs to New Delhi.
- Find the names of all the employees who work for Small Bank Corporation and company is situated at Chennai.
- Give all employees of First Bank Corporation a 10% raise.
- Find the names of all employees who are managers of the company.
- Delete all tuples in the works relation for employees of Small Bank Corporation.

- (b) What is the significance of Relational Algebra in DBMS? Describe the selection, projection and join operations of relational algebra with a suitable example. 2
- (c) What is integrity? Describe referential integrity with a suitable example. 2

**B. Tech.
Even Semester (4th Semester)
Major Examination 2021–2022
Computer Organization & Architecture**

Time: 03 Hrs.

Max. Marks: 50

Note: Attempt ALL questions. Each question carries equal Marks.

- Q.1** Attempt any five parts of the following: $(5 \times 2 = 10)$

a) Define bus arbitration. Also discuss serial bus arbitration with proper diagram.

b) Draw a diagram of bus system for Four registers of 4-bits each. The bus is to be constructed with multiplexers.

c) The outputs of four register R0, R1, R2, R3 are connected through 4-1 multiplexers to the inputs of the fifth register, R5. Each register is 8 bits long. The required transfer are dictated by four timing variables T0 through T3 as follows:

T0 : R5 ← R0

T1 : R5 ← R1

T2 : R5 ← R2

T3 : R5 ← R3

Draw a block diagram showing the hardware implementation of register transfers.

- d) Design 4-bit Arithmetic Circuit that performs Addition, Subtraction, Increment and Decrement operations.

Design 4 bit carry look ahead adder.

Explain the Differences between CISC and RISC.

Register A holds the 8-bit number 11011001. Determine the B operand and the logic micro-operation to be performed in order to change the value in A to:

- Q.2** Attempt any two parts of the following: (2 x 5 = 10)

- a)** Write a program to evaluate the arithmetic statement: -
$$X = : X = (A - B * C / D + E) / (F / G - H * I + J * K / L)$$

Using Three, Two, One and Zero address Machines.

b) Show the basic organization of a CPU in terms of registers and other units for a multiple-bus – organization. In such a CPU, show the complete action of the CPU in fetching and executing the instruction.

c)

 - c1 Write the sequence of control steps required for the structure of single bus organization for each of the following: -
 1. Add the number num to register r1.
 2. Add (R2), R1
 - c2 Design a expanding opcode to allow all of the following to be encoded in a 16-bit instruction and 4-bit addresses:
 - (i) 15 Instruction with three addresses.
 - (ii) 14 Instruction with two addresses.
 - (iii) 30 Instruction with one addresses.
 - (iv) 32 Instruction with zero addresses

(2 × 5 = 10)

Q.3 Attempt any two parts of the following:

Explain the Booth's algorithm for multiplication of signed 2's complement numbers along with flow chart and a suitable example.

- b) Work out the multi level look-ahead carry scheme for doing a 32-bit number addition. How many gate delays are required to do the complete addition in this method?

c) Explain floating-point addition and subtraction with a flowchart and also give the h/w structure for that.

Q.4 Attempt any two parts of the following:

(2 × 5 = 10)

- a) 4K x 16 RAM chips are used to construct 128K x 64 Memory. How many chips will be required? Draw a connection diagram.

b) Write short note on the following together with their importance:

- (i) Input-output Processor
- (ii) Serial Communication

c) Discuss the concept and implementation of virtual memory. Also describe a suitable scheme for translation from logical address to physical address.

Q.5 Attempt any two parts of the following:

(2 × 5 = 10)

- a) Describe DMA with suitable block diagram. Why does DMA have priority over the CPU when both request a memory transfer? Explain.

b) A block set associative cache consists of a total of 128 blocks divided into eight block sets. The main memory containing 4096 blocks each consisting of 32 words.
• How many bits are there in the main memory address?
• How many bits are there in each of TAG, SET and WORD field?

b) What is cache memory? Consider a system having 512K main memory organized as 16K blocks of 32 words each and a cache memory of 16K arranged as 512 blocks of 32 words each. Show how the mapping is done using direct mapping.

- c) Discuss the working principle of I/O processor (IOP). Illustrate the CPU-IOP communication with the help of flowchart.

B. Tech.
(SEM: IV) EVEN SEMESTER
MAJOR EXAMINATION 2021 – 2022

Optimization Technique

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

(5 × 2 = 10)

1. Attempt any five parts of the following:

- (a) Solve the following Linear Programming problem by Simplex method:
 $\text{Maximize } z = 5x + 3y \text{ subject to } x + y \leq 2, 5x + 2y \leq 10, 3x + 8y \leq 12, x \geq 0, y \geq 0.$
- (b) Consider the problem: $\text{Minimize } z = x + y$ subject to $x + 2y \geq 7, 4x + y \geq 6, x \geq 0, y \geq 0$. Solve by dual simplex method.
- (c) Give the dual of LP problem with proper justifications: $\text{Min } z = 2x_1 - 4x_2 + 5x_3$ subject to the constraints: $x_1 + 2x_2 - 5x_3 \geq 12, 4x_1 - 3x_2 - 8x_3 = 5, 3x_1 + 2x_2 - 5x_3 \leq 9$
 $x_1, x_2 \geq 0$ and x_3 is unrestricted.
- (d) Find all extreme points of the function $f(x_1, x_2, x_3) = 3x_1^3 - x_2^3 + x_3^3 - 4x_1 + 12x_2 - 24x_3$. Let the point $(\frac{2}{3}, -2, 2\sqrt{2})$ is the extreme point of the function, show the nature of this extreme point $(\frac{2}{3}, -2, 2\sqrt{2})$.
- (e) Find the minimum of the function $f(x) = x^5 - 5x^3 - 20x + 5$ in the range $(-1, 5)$ by Fibonacci method with taking $n = 5$. Also discuss the validity of results.

- (f) Discuss the nature of two non-zero extreme points of the problem:

$$f = x_1^3 - 3x_1x_2^2 + 6x_2^3 + x_2^2 + \left(\frac{1}{3}\right)x_3^3 - x_2x_3^2.$$

- (g) Maximize $f(x_1, x_2) = -2x_1^2 - 3x_2^2 + 2x_1x_2 + 3x_1 + 4x_2$ subject to the conditions $x_1 - 4 \leq 0$. By method of Kuhn – Tucker conditions. Discuss all cases.

2. Attempt any two parts of the following: **(2 × 5 = 10)**

- (a) Minimize $f(x_1, x_2, x_3) = 2x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 + 3x_2x_3 - x_1 - 2x_2$ with starting point $\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$ by Univariate method up to three iterations given that $\epsilon = 0.01$.
- (b) Minimize $f(x_1, x_2) = 6x_1^2 + 2x_2^2 - 6x_1x_2 - x_1 - x_2$ with starting point $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ by Steepest Descent method up to two iterations.

(a) Minimize $f(x_1, x_2) = 5x_1^2 - 3x_1x_2 + \left(\frac{3}{5}\right)x_2^2 - \left(\frac{5}{3}\right)x_1 - x_2$ in the range $-2 \leq x_1 \leq 4$ and $-3 \leq x_2 \leq 6$ by using random search method up to 10 iterations given the set of values as $\{(r_1, r_2) = (0.50, 0.60), (0.25, 0.26), (0.98, 0.97), (0.45, 0.46), (0.234, 0.235), (0.63, 0.64), (0.543, 0.544), (0.712, 0.713), (0.434, 0.435), (0.782, 0.783)\}$.

3. Attempt any two parts of the following: $(2 \times 5 = 10)$

(a) Minimize $f(x_1, x_2) = x_1^4 - 2x_1^2x_2 + x_2^2 + 10x_1 + 20x_2 + 10$ with starting point $\begin{pmatrix} 1.0 \\ -1.0 \end{pmatrix}$ by Newton's method up to two iterations.

(b) Explain the procedure to find the solution of Non-linear programming problem of the following methods (i) Steepest Descent method (ii) Newton's method.

(c) Minimize $f(x_1, x_2) = (x_1 + 2x_2 - 7)^2 + (2x_1 + x_2 - 5)^2$ with starting point $\begin{pmatrix} -1.0 \\ 1.0 \end{pmatrix}$ by Newton's method up to two iterations.

4. Attempt any two parts of the following: $(2 \times 5 = 10)$

(a) What is posynomial? Explain properly the procedure to solve the unconstrained Geometric minimization problem. Write the geometric dual of the given problem:
Minimize $f(X) =$

$$x_1x_2^{-1}x_3^{-2} + 2x_1^{-2}x_2^{-1}x_3 + 2x_1x_3x_2 + 3x_1x_2^{-1/2} + x_1^{1/2}x_3x_2, \quad x_i \geq 0, \quad i = 1, 2, 3.$$

(b) Optimize the geometric problem:

$$\text{Minimize } f(X) = 7x_1x_2^{-1} + 3x_2x_3^{-2} + 5x_1^{-3}x_2x_3 + x_1x_2x_3, \quad x_i \geq 0, \quad i = 1, 2, 3.$$

(c) Derive the geometric dual of given problem: $\text{Min } f(X) = x_1^{-4}x_2 + x_1^{\frac{3}{2}}x_2^{-2}x_3^{-\frac{1}{3}} + x_1x_2^{-3}x_3^{-1}$ subject to $\frac{7}{5}x_1^3x_2^{-1} + 6x_1^{-1}x_3^{-1/2} \leq 1$.

5. Attempt any two parts of the following: $(2 \times 5 = 10)$

(a) Minimize $f(X) = x_1^{-2}x_2^{-1} + \frac{1}{4}x_1^2x_2^{-1}x_3^{-1} + x_1^{-1}x_3^2x_4$, subject to $\frac{3}{4}x_1x_2 + \frac{3}{8}x_2x_3x_4^{-3} \leq 1$ $x_i \geq 0, \quad i = 1, 2, 3$ by geometric programming method.

(b) Minimize $f(X) = 10x_2x_3x_4^4 + 40x_1^2x_3^{-1} + 5x_2x_3^2$ subject to $5x_2^{-5}x_3^{-1} \leq 1$, $10x_1^{-1}x_2^3x_4^{-1} \leq 1, \quad x_i > 0, \quad i = 1 \text{ to } 4$

by geometric programming method.

(c) Minimize x_1 subject to

$$\begin{aligned} -3x_1^2 + 4x_2 &\leq 1, \\ x_1 + x_2 &\geq 1, \end{aligned}$$

and $x_1 > 0, x_2 > 0$ by procedure of complementary geometric programming method.

**Management Information System
B.Tech. (IV Sem.) MBA (II Sem.) Even Semester
Major Examination 2021-2022**

Max Marks :50 Time: 3 Hrs

Note : Attempt all Questions. Each Questions carry equal marks.

1. Attempt any five parts of the following: (5 X 2=10)

- (a) What are the objectives of Management Information System?
- (b) Write short notes on: a) Information b) System
- (c) Define Management and its function.
- (d) Describe the key features of MIS.
- (e) What do you mean by user training? Elaborate.
- (f) Elaborate the term strategic planning.
- (g) Define potential benefits of collecting the data.

2. Attempt any two parts of the following:(5 X 2=10)

(2 x 5 = 10)

- (a) Define information flow chart. Explain its implication and importance.
- (b) What are three different levels of management? Highlight the role of each management levels in terms of MIS.
- (c) What is documentation and formats in Management Information System? Explain in detail.

3. Attempt any two parts of the following:(5 X 2=10)

- (a) Define designing of MIS. Elaborate water fall model in the context of MIS designing.
- (b) What are the stages of planning of MIS? How it is helpful for the Organization?
- (c) Discuss some basic need and dimensions for management information system.

4. Attempt any two parts of the following:(5 X 2=10)

- (a) What are the constraints in MIS operation? Discuss its limitations.
- (b) What do you know about source of information in MIS? Discuss some relevant source of information
- (c) How will you define the approaches of development of MIS ?Also define at least two types of development approaches.

5. Attempt any two parts of the following:

(5 X 2=10)

- (a) Throw light on implantation of MIS. Explain its all methods in the organization.
- (b) Discuss the behavioral implications of MIS.
- (c) What are the approaches of evaluation of MIS? Make understand product-based evaluation.

B. Tech

(SEM-IV) EVEN SEMESTER

MAJOR EXAMINATION 2021-22

Database Management System

Max. Marks: 50

Time: 3Hrs.

Note: Attempt all questions. Each question carries equal marks.

Q 1. Attempt any five parts of the following.

$5 \times 2 = 10$

- (a) Define and differentiate the database system and file system.
- (b) What is the significance of Data Model in database management system? Explain the Hierarchical data model in brief.
- (c) Distinguish between Conceptual Database and Physical Database. What types of data independence are obtained because of them?
- (d) Explain the term Generalization and Specialization with suitable example.
- (e) What is the significance of Relational Algebra in DBMS? Describe the selection, projection and join operations of relational algebra with a suitable example.
- (f) What are the various functions in SQL? Illustrate the five aggregate functions of SQL with a suitable example.
- (g) Describe the various characteristics and advantages of SQL.

Q 2. Attempt any two parts of the following.

$2 \times 5 = 10$

- (a) What is Functional Dependency? Describe the various Armstrong's axioms with a suitable example.
- (b) What is partial functional dependency? Describe the second normal form (2NF) with a suitable example.
- (c) What is the significance of Lossless Join Decomposition of a relation? Consider the relation schema, $R = \{A, B, C, D, E\}$ is decomposed into relations $R1 = \{A, B, C\}$ and $R2 = \{A, D, E\}$. The FDs defined over R are given by set F:
 $\{A \rightarrow CD, B \rightarrow D, CD \rightarrow E, E \rightarrow A\}$. Determine whether the decomposition of R is lossless or not.

Q 3. Attempt any two parts of the following. $2 \times 5 = 10$

- (a) What is Join Dependency? Normalize the following table of employees to 3NF. Primary keys are marked by *.
EMP (*Emp_code, Dept_code, Mgr_code, Course_code, Course_title).
- (b) Describe the Boyce Codd Normal Form (BCNF) with a suitable example. Is BCNF stronger than 3NF? Justify your answer with a suitable example.
- (c) What is multivalued dependency (MVD)? Illustrate the fourth and fifth normal form with a suitable example.

Q 4. Attempt any two parts of the following. $2 \times 5 = 10$

- (a) Illustrate the ACID properties of transaction. Draw a state diagram and discuss the typical states that a transaction goes through during execution.
- (b) What do you mean by schedule in the context of concurrent execution of transactions in RDBMS? Describe the various types of serializability with a suitable example.
- (c) What is concurrency control? Describe the two-phase locking protocol (2PL) along with its limitations.

Q 5. Attempt any two parts of the following. $2 \times 5 = 10$

- (a) How does timestamp ordering protocol work? Explain with a suitable example.
- (b) What is deadlock? How is deadlock detected? Describe the wait-die and wound-wait scheme of deadlock prevention with a suitable example.
- (c) What is Multiple granularity? Explain how granularity of locking affects the performance of concurrency control algorithm.

B TECH
EVEN SEMESTER
MAJOR EXAMINATION 2021 - 2022
DESIGN AND ANALYSIS OF ALGORITHMS

Q. No. **Marks**
5×2=10

1. Attempt any Five parts of the following:

(a) What is computer algorithm? Write down the characteristics of a computer algorithm.

(b) Consider the following algorithm:

Procedure sum(n: positive integer)

s := 0

for i := 1 to n

 for j := 1 to i

 s := s + j

 return s

Suppose that procedure sum is started with input n = 4.

Then what number is returned by the algorithm.

(c) Consider the following recurrence:

$$T(n) = 4T(n/2) + n^3$$

Find its asymptotic time bound using Master Method.

(d) Explain in brief the Merge Sort algorithm. You are further required to write the strategy used to design the merge sort algorithm.

(e) Apply bubble sort Algorithm to sort the following initial array of elements in increasing order:

25, 6, 15, 12, 8, 34, 9, 18, 2

(f) Using state space tree, prove that:

- There are multiple solutions for a 4-queen problem

(g) Write down the properties of B-Tree.

Q. No. **Marks**
2×5=10

2. Attempt any Two parts of the following:

(a) Given 10 activities along with their start and finish time as

$$S = \{A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}\}$$

$$s_i = \{1, 2, 3, 4, 7, 8, 9, 9, 11, 12\}$$

$$f_i = \{3, 5, 4, 7, 10, 9, 11, 13, 12, 14\}$$

Compute a schedule where the largest numbers of activities take place.

(b)

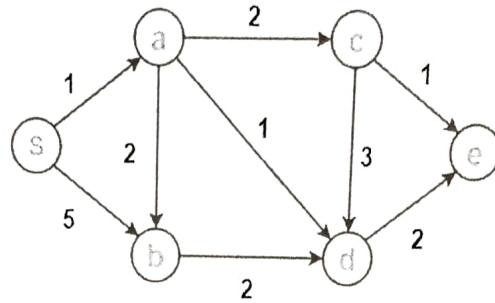


Fig. 1

Using Dijkstra's Algorithm, find the shortest distance from source vertex 'S' to remaining vertices given in fig.1. You are also required to write the order in which the vertices are visited

- (c) Explain knapsack problem with suitable example. You are also required to design an algorithm to solve knapsack problem and comment on the time complexity of the designed algorithm.

Q. No.

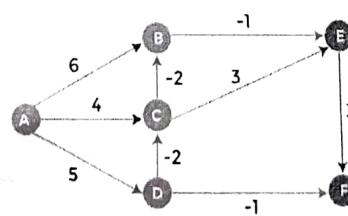
Marks

3. Attempt any Two parts of the following:

$2 \times 5 = 10$

- (a) Explain in brief the Dynamic programming method of algorithm design using suitable example.

- (b) Find shortest path from one fixed source node to all other nodes for the following graph using Bellman-Ford algorithm. (Assume source node is "A" in the following given graph.)



(e) Write down the differences between Prim's and Kruskal's algorithm for finding the Minimum Spanning Tree of a given graph. You are further required to compare with respect to efficiency analysis.

Marks
2×5=10

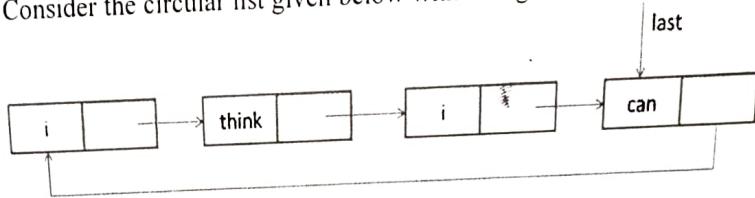
Q. No. 4. Attempt any Two parts of the following:

- (a) Explain concept of Sum of Subsets problem. You are further required to design an algorithm to find the sum of subsets using backtracking method of algorithm design.
 (b) Show the comparisons the Naïve-String matcher makes for the Pattern $P = \{10001\}$ in the text

$$T = \{0000100010010\}$$

and also show that worst case time to find the first occurrence of a pattern in a text is $O((n-m+1)(m-1))$.

- (c) Consider the circular list given below with string data:



Write an algorithm which will display the output in following fashion:

i think i can
think i can
i can
can

Marks

Q. No. 5. Attempt any Two parts of the following:

2×5=10

- (a) What do you mean by Polynomial time verification and reduction?
 Explain.
 (b) Explain the concept of approximation algorithms using suitable example.
 (e) What do you mean by NP-Hard class of problems? Explain with suitable example.
