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| <b>3E1201</b>   | Roll No. _____ | Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">4</span> |
| <p><b>3E1201</b></p> <p><b>B. Tech. III - Sem. (Main / Back) Exam., February - 2023</b></p> <p><b>Artificial Intelligence &amp; Data Science</b></p> <p><b>3AID2 – 01 Advanced Engineering Mathematics</b></p> <p><b>AID, CAI, CS, IT</b></p> |                |   |

**Time: 3 Hours**

**Maximum Marks: 70**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 Find the value of the constant c such that the function  $f(x) = \begin{cases} cx, & 0 < x < 3 \\ 0, & \text{Otherwise} \end{cases}$  is a probability density function.

Q.2 If  $E(X) = 4$  and  $E(Y) = 1$ , then what is the value of  $E(2X + 3Y)$ ?

Q.3 Define Binomial distribution and write its mean and variance.

Q.4 How many number of normal equations are required for fitting a polynomial of m degree, by least square method?

Q.5 What is optimization?

Q.6 What is the difference between linear and nonlinear programming problems?

Q.7 What is Lagrangian function?

Q.8 Under what circumstances can the condition  $f'(x) = 0$  not be used to find the minimum of the function  $f(x)$ ?

Q.9 If the given LPP has an optimal solution, then what about the solution of dual problem?

Q.10 For non-degenerate feasible solution of  $m \times n$  transportation problem, how many independent individual positive assignments will be required?

### **PART - B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions**

Q.1 The distribution function for a random variable X is  $F(x) = \begin{cases} 1 - e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$ .

Find (a) the density function and (b)  $P(-3 < X \leq 4)$ .

Q.2 If X is uniformly distributed with mean 1 and variance  $4/3$ , then estimate  $P(X < 0)$ .

Q.3 Discuss the rank correlation coefficient for the data given below –

|   |    |    |    |    |    |
|---|----|----|----|----|----|
| x | 10 | 12 | 15 | 14 | 19 |
| y | 40 | 41 | 48 | 60 | 50 |

Q.4 A company desires to devote the excess capacity of the three machines lathe, shaping and milling to make three products A, B and C. The available time per month in these machines are tabulated below –

| Machine                  | Lathe     | Shaping   | Milling   |
|--------------------------|-----------|-----------|-----------|
| Available time per month | 200 hours | 110 hours | 180 hours |

The time (in hours) taken to produce each unit of the products A, B and C on the machines is displayed in the table below –

| Machine   | Lathe | Shaping | Milling |
|-----------|-------|---------|---------|
| Product A | 5     | 2       | 4       |
| Product B | 2     | 2       | Nil     |
| Product C | 3     | Nil     | 3       |

The profit per unit of the products A, B and C are ₹ 20, ₹ 15 and ₹ 12 respectively. Formulate the mathematical model to maximize the profit.

Q.5 Find the maxima and minima of the function  $u = x^3 + y^3 - 3x - 12y + 25$ .

Q.6 Using Lagrange's multiplier method, solve the following problem -

Maximize  $Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$

Subject to  $x_1 + x_2 = 4$

and  $x_1, x_2 \geq 0$ .

Q.7 Construct the dual of the following problem -

Minimize  $Z = x_1 - 3x_2 + 3x_3$

Subject to  $3x_1 - x_2 + 2x_3 \leq 7, 2x_1 - 4x_2 \geq 12, 4x_1 - 3x_2 - 8x_3 \geq 10$

and  $x_1, x_2, x_3 \geq 0$ .

## PART - C

(Descriptive/Analytical/Problem Solving/Design Questions) [3×10=30]

Attempt any three questions

Q.1 Joint Distribution Function of two discrete random variable X and Y are given by  $f(x, y) = c(2x + y)$ , where x and y assumes all integer values such that  $0 \leq x \leq 2$ ,  $0 \leq y \leq 3$ .

Find (i) c, (ii)  $P(X = 2, Y = 1)$ , (iii)  $P(X \geq 1, Y \leq 2)$ , (iv) Marginal Distribution and (v) Check the dependency.

Q.2 Applying the theory of least square method, fit a second degree parabola to the following data -

|   |   |   |    |    |    |
|---|---|---|----|----|----|
| x | 0 | 1 | 2  | 3  | 4  |
| y | 1 | 5 | 10 | 22 | 38 |

Q.3 Write a short note on the classification of optimization problems based on various parameters.

Q.4 Using two phase simplex method, solve the following linear programming problem -

Min.  $z = 2x_1 + 9x_2 + x_3$

Subject to  $x_1 + 4x_2 + 2x_3 \geq 5$

$3x_1 + x_2 + 2x_3 \geq 4$

and  $x_1, x_2, x_3 \geq 0$ .

Q.5 Solve the following transportation problem -

|             |     |   |   |    |           |
|-------------|-----|---|---|----|-----------|
|             |     | 1 | 2 | 3  | Available |
|             | I   | 2 | 7 | 4  | 5         |
| From        | II  | 3 | 3 | 7  | 8         |
|             | III | 5 | 4 | 1  | 7         |
|             | IV  | 1 | 6 | 2  | 14        |
| Requirement |     | 7 | 9 | 18 |           |

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|--|----------------|---|
| <b>3E1136</b>  | Roll No. _____ | Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">4</span> |
| <p><b>3E1136</b></p> <p><b>B. Tech. III - Sem. (Back) Exam., February - 2023</b></p> <p><b>Computer Science &amp; Engineering</b></p> <p><b>3CS2 – 01 Advanced Engineering Mathematics</b></p> <p><b>Common For CS, IT</b></p> |                |   |

Time: 3 Hours

Maximum Marks: 120

Min. Passing Marks: 42

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL2. NIL**PART – A****(Answer should be given up to 25 words only)****[10×2=20]****All questions are compulsory**

- Q.1 Let  $X = \{-1, 1\}$  be random variable with probability density function  $f(x = 1) = 1/2$  and  $f(x = -1) = 1/2$ , find the moment generating function.
- Q.2 State the condition for which binomial distribution becomes symmetric.
- Q.3 Write Chebyshev's Inequality.
- Q.4 What will be the value of coefficient of correlation when two regression lines coincide?
- Q.5 If X has the variance 9 and Y has the variance 5, then write the value of  $\text{var}(2X + Y - 5)$ .

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- Q.6 Feasible region's optimal solution for a linear objective function always includes which points?
- Q.7 In transportation models designed in linear programming, write the name of "points of demand".
- Q.8 Which solutions are included in the convex set of equations in a linear programming equations?
- Q.9 Let  $X_1$  and  $X_2$  are two independent variables and  $Y = a_1X_1 + a_2X_2$ , then write the variance of Y.
- Q.10 What is the name of specific combination of decision variables to specify non – negativity and structural constraints in optimization problem?

**PART – B**

**(Analytical/Problem solving questions)**

**[5×8=40]**

**Attempt any five questions**

- Q.1 A firm manufacturing two type of electrical items. A and B can make a profit of ₹ 20 per unit of A and ₹ 30 per unit of B. Each unit of A requires 3 motors and 2 transformers and each unit of B requires 2 motors and 4 transformers. The total supply of these per month is restricted to 210 motors and 300 transformers. Type B is an expert model requiring a voltage stabilizer, which has supply restricted to 65 units per month. Formulate above as a linear programming problems for maximum benefit.
- Q.2 Let  $f(x,y) = \begin{cases} 1 & 0 < x < 1, 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$  be the joint density function of X and Y. Find the density function of  $Z = XY$ .
- Q.3 Classify optimization problems based on existence of constraints and nature of design variables.

Q.4 The regression lines of y on x and x on y are  $y = ax + b$  and  $x = cy + d$ , respectively. Show that -

$$\frac{\sigma_y}{\sigma_x} = \sqrt{\frac{a}{c}}; \quad \bar{x} = \frac{bc+d}{1-ac} \quad \bar{y} = \frac{ad+b}{1-ac}$$

Q.5 Find maximum of the function  $f(X) = 2x_1 + x_2 + 10$  subject to  $g(X) = x_1 + 2x_2^2 = 3$  using the Lagrange multiplier method. Also find the effect of changing the right hand side of the constraint on the optimum value of f.

Q.6 Find the dual of the following LPP:

$$\min z = x_1 + x_2 + x_3 \text{ such that } x_1 - 3x_2 + 4x_3 \leq 5;$$

$$2x_1 - 2x_2 \leq -3;$$

$$2x_2 - x_3 \geq 5; \quad x_1, x_2, \geq 0, x_3 \text{ is unrestricted.}$$

Q.7 If the probability that an individual will suffer a bad reaction from injection of a given serum is 0.001. Determine the probability that out of 2000 individuals (a) exactly 3 (b) more than 2 individuals will suffer from bad reaction.

### PART - C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 Find first four moments and moment generating function of exponential distribution.

Q.2 Consider the problem -

$$\text{minimize } f(x_1, x_2) = (x_1 - 1)^2 + x_2^2$$

$$\text{subject to } g_1(x_1, x_2) = x_1^3 - 2x_2 \leq 0;$$

$$g_2(x_1, x_2) = x_1^3 + 2x_2 \leq 0;$$

Determine whether the constraint qualification and the Kuhn - Tucker conditions are satisfied at the optimum point.

Q.3 Four different jobs can be done on four different machines and take down time costs are prohibitively high for change overs. The matrix below gives the cost in rupees of producing job  $i$  on machine  $j$ :

| Jobs           | Machine        |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
|                | M <sub>1</sub> | M <sub>2</sub> | M <sub>3</sub> | M <sub>4</sub> |
| J <sub>1</sub> | 5              | 7              | 11             | 6              |
| J <sub>2</sub> | 8              | 5              | 9              | 6              |
| J <sub>3</sub> | 4              | 7              | 10             | 7              |
| J <sub>4</sub> | 10             | 4              | 8              | 3              |

How the jobs should be assigned to the various machines so that the total cost is minimized?

Q.4 Solve the following LPP:

$$\begin{aligned} \min z = x_1 - 3x_2 + 2x_3 \text{ such that } & 3x_1 - x_2 + 3x_3 \leq 7; \\ & -2x_1 + 4x_2 \leq 12; \\ & -4x_1 + 3x_2 + 8x_3 \leq 10; \quad x_1, x_2, x_3 \geq 0. \end{aligned}$$

Q.5 Let  $X$  and  $Y$  be continuous random variables having joint density function

$$f(x, y) = \begin{cases} c(x^2 + y^2) & 0 < x < 1, 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

Determine (a) constant  $c$ , (b)  $P(X < 1/2, Y > 1/2)$ ,  $P(1/4 < X < 3/4)$ ,  $P(Y < 1/2)$  (c) marginal density functions of  $X$  and  $Y$ , (d) whether  $X$  and  $Y$  are independent (e) conditional distributions of  $X$  and  $Y$ .

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3E1656

Roll No. \_\_\_\_\_

Total No. of Pages: 4

3E1656

B. Tech. III - Sem. (Back) Exam., February - 2023

Computer Science &amp; Engineering

3CS6A Advanced Engineering Mathematics-I

CS, IT

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL \_\_\_\_\_

2. NIL \_\_\_\_\_

**UNIT- I**

Q.1 (a) What is optimization? Write ten engineering applications of optimization techniques. [8]

(b) Find the maxima and minima of the function. [8]

$$u = x^3 + y^3 - 3x - 12y + 25.$$

**OR**

Q.1 (a) Write a short note on the classification of optimization problems based on various parameters. [8]

(b) Using the direct substitution method, find minimum value of  $x^2 + y^2 + z^2$  when  $ax + by + cz = p$ . [8]

## UNIT- II

Q.2 (a) A company manufactures two product A and B, which are processed in the same machine. It takes 10 minutes to process one unit of product A and 3 minutes for each unit of product B and the machine operates for a maximum of 35 hours per week. Product A requires 0.8 kg and B requires 0.4 kg of raw material per unit. The supply of raw material is 500 kg per week. Market requires at least 700 units of product B every week. Product A costs ₹ 4 per unit and sold at ₹ 10, whereas B costs ₹ 6 per unit and sold at ₹ 8. Formulate the linear programming problem to maximize the profit. [6]

(b) Using Simplex method, solve the following linear programming problem – [10]

Maximize  $z = x_1 + 2x_2$

Subject to  $x_1 - x_2 \leq 10$

$$3x_1 - 2x_2 \leq 40$$

$$x_1, x_2 \geq 0$$

**OR**

Q.2 (a) Write the dual of the following linear programming problem - [6]

Maximize  $z = x_1 + 4x_2 + 3x_3$

Subject to  $2x_1 + 3x_2 - 5x_3 \leq 2,$

$$3x_1 - x_2 + 6x_3 \geq 1,$$

$$x_1 + x_2 + x_3 = 4$$

and  $x_1, x_2, x_3 \geq 0$

(b) Solve the following transportation problem - [10]

|      |             |   |   |    |           |
|------|-------------|---|---|----|-----------|
|      |             | 1 | 2 | 3  | Available |
| From | I           | 2 | 7 | 4  | 5         |
|      | II          | 3 | 3 | 7  | 8         |
|      | III         | 5 | 4 | 1  | 7         |
|      | IV          | 1 | 6 | 2  | 14        |
|      | Requirement | 7 | 9 | 18 |           |

**UNIT- III**

- Q.3 (a) State and prove Chinese Remainder theorem. [8]  
 (b) Define the following – [8]  
 (i) Jacobi Symbol  
 (ii) Prime numbers

**OR**

- Q.3 (a) Prove that every infinite cyclic group has two and only two generators. [8]  
 (b) If n is a positive integer and k is a relative prime to n, then prove that – [8]  
 $k^{\phi(n)} = 1 \pmod n$

**UNIT- IV**

- Q.4 (a) Find the Laplace transform of  $(x - 2\sin x)^2$ . [8]  
 (b) Using convolution theorem, evaluate  $L^{-1} \left\{ \frac{s}{(s^2 + a^2)^2} \right\}$ . [8]

**OR**

- Q.4 (a) Find Laplace transform of  $\frac{\sin ax}{x}$ . Does the Laplace transform of  $\frac{\cos ax}{x}$  exist? [8]  
 (b) Using Laplace transform, solve the differential equation - [8]  
 $y'' + 25y = 10 \cos 5x, \quad y(0) = 2, \quad y'(0) = 0$

**UNIT- V**

Q.5 (a) Using Newton Gregory forward interpolation formula, find the polynomial, which passes through the points (1, -1), (2, -1), (3, 1) and (4, 5). [8]

(b) Use Simpson's '1/3' and '3/8' rule to evaluate the following – [8]

$$\int_0^1 \frac{dx}{1+x}$$

**OR**

Q.5 (a) Use Stirling formula to find  $y_{25}$ , given that - [8]

$$y_{20} = 24, y_{24} = 32, y_{28} = 35, y_{32} = 40.$$

(b) Using Runge-Kutta fourth order method, obtain  $y(0.1)$  and  $y(0.2)$  form the equation. [8]

$$\frac{dy}{dx} = x + y ; y(0) = 1$$

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3E1250

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Total No. of Pages: 2

**3E1250**

**B. Tech. III - Sem. (Main / Back) Exam., February - 2023**

**Artificial Intelligence & Data Science**

**Technical Communication**

**Common to all Branches**

**Time: 3 Hours**

**Maximum Marks: 70**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART - A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What are the four main features of technical communication?
- Q.2 What are linguistic abilities?
- Q.3 Name the different types of manuals?
- Q.4 Which is more reliable- Print Media or Online Media? Why?
- Q.5 What is the meaning of document design?
- Q.6 What are the steps in Technical Proposal Writing?
- Q.7 Mention the types of technical article.
- Q.8 How can you improve your Speaking Skills?
- Q.9 What is the difference between Listening and Hearing?
- Q.10 Why is reading important for improving Communication Skills?

## **PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions**

- Q.1 Discuss the aspects of Technical Communication in detail.
- Q.2 Draft a report on various curricular and co-curricular activities organized in your department/college to be published on RTU website.
- Q.3 There is no canteen in your company. Write a proposal to establish a canteen in your College/Institute.
- Q.4 Discuss the difference between agenda and minutes of meeting. What are the objectives of agenda?
- Q.5 Correct the following sentences:
- (1) She always felt inferior than her younger sister.
  - (2) I have visited Niagara Falls last weekend.
  - (3) The woman which works here is from Rajasthan
  - (4) She's married with a dentist.
- Q.6 Explain the form/ format/ structure/ style of writing Official Notes.
- Q.7 What are some strategies for an effective editing and proofreading?

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[3×10=30]**

**Attempt any three questions**

- Q.1 What is Style in Technical communication? Explain the guidelines for writing a good technical document.
- Q.2 Define the term technical communication. Explain the process (cycle) of communication in detail.
- Q.3 What is a Technical Report? Explain in detail about the type, characteristic and objectives of Technical Report.
- Q.4 Describe the factor which influence information and document design.
- Q.5 Evaluate your education, professional training, skills, accomplishments and achievement, interest/ activities and experience. Write a **resume** for the post of computer executive.
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3E1102

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Total No. of Questions:

Total No. of Pages:

Roll No. \_\_\_\_\_

**B.Tech. III-Sem (Back) Exam 2023  
HSMCAeronautical Engineering  
3AN1-02 Technical Communication  
3E1102**

**All branches**

**Time: 2 Hours**

**Maximum Marks: 80**

**Min. Passing Marks: 28**

**Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.**

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1.NIL \_\_\_\_\_

2.NIL \_\_\_\_\_

**Part A (Answer should be given up to 25 words only)**

**All questions are compulsory**

- Q.1 Justify the statement "Communication means exchange of information".
- Q.2 Give a comprehensive definition of the term "Information design".
- Q.3 What do you understand by "forms of technical discourse?"
- Q.4 Name different types of technical articles.
- Q.5 Distinguish between personal and business letter writing.

**5 x 2 = 10**

**Part B Analytical/Problem solving questions**

**Attempt any four questions**

- Q.1 There is no medical dispensary in your college campus. So write a proposal to establish a dispensary in the campus inventing all necessary details.
- Q.2 Recently your college held a Seminar on Conservation of Water as a part of World Water Day celebrations. Write a report in 100-125 words for a local daily. Sign as Sweety/Suresh.
- Q.3 Explain the guidelines for planning, drafting and writing a good Official Notes.

Q.4. What are some of the most important skills for a technical communicator to have? Discuss in detail.

Q.5 On the basis of your reading of the passage given below, make notes in points only, using abbreviations, wherever necessary. Also, suggest a suitable title.

Despite all the research every one of us catches cold and most of us catch it frequently. Our failure to control one of the commonest of all ailments sometimes seems ridiculous. Medical science regularly practices transplant surgery and has rid whole countries of such killing diseases as Typhus and the Plague. But the problem of common cold is unusually difficult and much has yet to be done to solve it. It is known that a cold is caused by one of a number of viral infections that affect the lining of the nose and other passages leading to the lungs but the confusing variety of viruses makes study and remedy very difficult. It was shown in 1960 that many typical colds in adults are caused by one or the other of a family of viruses known as rhinoviruses, yet there still remain many colds for which no virus has as yet been isolated.

There is also the difficulty that because they are so much smaller than the bacteria which cause many other infections, viruses cannot be seen with ordinary microscopes. Nor can they be cultivated easily in the bacteriologist's laboratory, since they only grow within the living cells of animals or plants. An important recent step forward, however, is the development of the technique of tissue culture, in which bits of animal tissue are enabled to go on living and to multiply independently of the body. This has greatly aided virus research and has led to the discovery of a large number of viruses.

Q.6 Fill in the blanks:

1. We saw wounded tiger while passing .....the forest.
  - a) from
  - b) through
  - c) along
  - d) among
2. There was nothing he could do ..... wait.
  - a) and
  - b) except
  - c) otherwise



- d) than
3. That old house is being offered .....sale.
- a) in
  - b) at
  - c) on
  - d) for
4. He was..... after his workout.
- a) exhausted
  - b) exhaust
  - c) exhausting
  - d) too exhausting
5. She has just become .....RAS officer.
- a) an
  - b) a
  - c) no article
  - d) the

4 x 10 =40

**Part C(Descriptive/Analytical/Problem Solving/Design Question)**

**Attempt any two questions**

- Q. 1 What is technical communication? Discuss the different functions of communication.
- Q.2 What is the difference between agenda and minutes of meeting? How long before a meeting should an agenda be sent out? What are the objectives of agenda?
- Q.3 Evaluate your education, professional training, skills, accomplishments or achievement, interest/activities and experience and write resume for the post of computer executive.

2 x 15 =30

3E1203

Roll No. \_\_\_\_\_

Total No. of Pages: 2**3E1203****B. Tech. III - Sem. (Main / Back) Exam., February - 2023****Artificial Intelligence & Data Science****3AID3 – 04 Digital Electronics****AID, CAI, CS, IT****Time: 3 Hours****Maximum Marks: 70***Instructions to Candidates:**Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.**Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.**Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*1. NIL2. NIL**PART – A****(Answer should be given up to 25 words only)****[10×2=20]****All questions are compulsory**

- Q.1 Write the difference between Latch and Flip-flop.  
 Q.2 Explain the Excess-3 code.  
 Q.3 Convert the following numbers –  
 (i)  $(250.5)_{10} = ( )_2$   
 (ii)  $(101110.01)_2 = ( )_8$   
 Q.4 What is Master Slave Flip-flop?  
 Q.5 What is the operation of SR Flip-flop?  
 Q.6 Simplify the following expression  $Y = (A+B)' (A'+B)'$ .  
 Q.7 Compare Combinational and Sequential circuits.  
 Q.8 Which gates are called universal gates? What are its advantages?  
 Q.9 Mention the expressions for difference and borrow of Full Subtractor.  
 Q.10 Explain De Morgan's law.

## PART – B

(Analytical/Problem solving questions)

[5×4=20]

Attempt all five questions

- Q.1 Implement BCD to 7-segment decoder and cathode type using 4:16 decoder.
- Q.2 What is Digital System? Write the characteristics of digital systems.
- Q.3 Explain the Half Adder. Implement the full adder using two half adders.
- Q.4 What is a shift register? Explain the working of 4-bit universal shift register.
- Q.5 Implement the following Boolean function using 8:1 multiplexer  
 $F(A,B,C,D) = \sum m(0, 1, 2, 5, 7, 8, 9, 14, 15)$ .
- Q.6 Discuss the following concerns with Logic Families and Semiconductor Memories -  
(i) Noise margin  
(ii) Propagation delay  
(iii) Fan-in, fan-out
- Q.7 Design an octal to binary encoder.

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[3×10=30]

Attempt any three questions

- Q.1 Design of a synchronous BCD Up-Down counter using FFs.
- Q.2 Write a short note -  
(i) Encoder  
(ii) Decoder  
(iii) Multiplexer
- Q.3 Simplify the Boolean expression using K-map and implement using NAND gates  
 $F(A,B,C,D) = \sum m(0, 2, 3, 8, 10, 11, 12, 14)$
- Q.4 Write about the following -  
(i) Transistor-transistor Logic (TTL)  
(ii) Emitter-coupled Logic (ECL)  
(iii) CMOS Logic
- Q.5 Draw and explain the following using a truth table and logic diagrams -  
(i) J-K Flip-flop  
(ii) D-Flip-flop  
(iii) T-Flip-flop

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|---------------|---|---|
| <b>3E1137</b> | Roll No. _____  | Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">2</span> |
|               | <b>3E1137</b><br><b>B. Tech. III - Sem. (Back) Exam., February - 2023</b><br><b>Computer Science &amp; Engineering</b><br><b>3CS3-04 Digital Electronics</b><br><b>CS, IT</b> |   |

Time: 3 Hours

Maximum Marks: 120  
Min. Passing Marks: 42

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

### PART - A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 State and prove De Morgan's theorem.
- Q.2 Convert the following - (i)  $(BC)_{16} = ()_{10}$ , (ii)  $(1000011)_2 = ()_{10}$
- Q.3 Perform the following (a) Subtraction using 9's complement for the given 54321-41245.
- Q.4 Convert the following to binary and then to gray code  $(1111)_{16}$ .
- Q.5 Explain the Binary Codes.
- Q.6 Mention the types of counter.
- Q.7 What is a flip-flop?
- Q.8 Write about Gray to the binary convertor.
- Q.9 Explain briefly about the S-R flip-flop.
- Q.10 Write a comparison of various logic families.

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## PART – B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

- Q.1 Explain half adder and full adder with an example each.
- Q.2 Explain -
- (a) Encoder – Decoders
  - (b) BCD to 7 segment decoder.
- Q.3 Explain the 4-line to 16-line de multiplexer.
- Q.4 Implement the following Boolean function using 4:1 Multiplexer  $F(A, B, C) = \sum(1, 2, 6, 7)$ .
- Q.5 Obtain the simplified expression using K-map for the following Boolean function.  
 $F(A, B, C, D, E) = \sum(0, 1, 4, 5, 16, 17, 21, 25, 29)$ .
- Q.6 Draw and explain the 4-bit Universal shift register.
- Q.7 Discuss the following in concern with Logic Families and Semiconductor Memories –
- (a) Noise margin
  - (b) Propagation delay
  - (c) Fan-in, fan-out

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[4×15=60]

Attempt any four questions

- Q.1 (a) Draw the logic diagram of a JK-flip flop and explain its operation.  
(b) What is the need for Master Slave JK FF and explain its operation with neat diagrams?
- Q.2 (a) Write the design procedure for a combinational circuit.  
(b) Design & implement 4-bit Adder/subtractor.
- Q.3 Write a short note on –
- (a) TTL Logic
  - (b) ECL
  - (c) CMOS Digital logic families
- Q.4 (a) Compare Synchronous and Ripple counters.  
(b) Design and implement Mod-10 Synchronous Up counter using T-FFs.
- Q.5 (a) Explain the operation of an SR flip-flop using an excitation table. Give its Truth Table and characteristic equation.  
(b) Give the characteristic table, Truth table, Characteristic equation, and excitation table for T and DFF.

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3E1202

Roll No. \_\_\_\_\_

Total No. of Pages: 3

**3E1202**

**B. Tech. III - Sem. (Main/Back) Exam., February - 2023**

**Artificial Intelligence & Data Science**

**3AID4-05 Data Structures and Algorithms**

**AID,CAI,CS,IT**

**Time: 3 Hours**

**Maximum Marks: 70**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 How stack is represented using dynamic array? Explain with example.

Q.2 Identify the applications of stack.

Q.3 Elaborate the disadvantages of Linked List over Arrays.

Q.4 Justify how circular queue is different from normal queue.

Q.5 Differentiate between sequential and binary search.

- Q.6 Illustrate different traversal techniques used in binary search tree.
- Q.7 List out best, average and worst case complexity of merge and quick sort.
- Q.8 Examine the relationship between number of nodes and height of AVL tree.
- Q.9 Determine advantages and disadvantages of adjacent matrix representation for graphs.
- Q.10 Explain how quadratic probing is done.

## **PART – B**

[5×4=20]

### **(Analytical/Problem solving questions)**

#### **Attempt any five questions**

- Q.1 Convert the following infix expression into postfix expression :
- $$A + B - (C + D) / E * F - (G + H) / I$$
- Q.2 Consider the preorder of a BST :
- Pre-order: 20, 5, 3, 4, 10, 15, 30, 25, 40
- What will be the post-order?
- Q.3 Write an algorithm to enqueue and dequeue an element in a queue.
- Q.4 Sort the following elements using quick sort :
- 28 5 16 36 11 19 25
- Q.5 Write an algorithm for DFS traversal.
- Q.6 What is a MST? Differentiate between Kruskal and Prim's algorithm with their time complexity.
- Q.7 Explain the algorithm for deleting an element from doubly linked list.

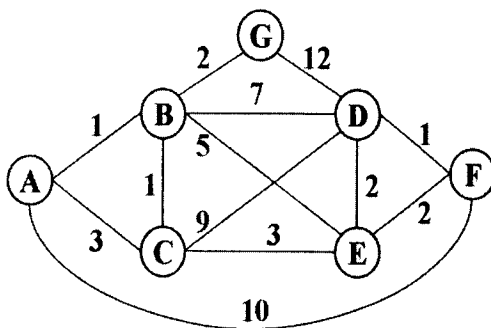
**PART – C**

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

- Q.1 Examine each step involved with Radix sort to sort the given array -  
329, 457, 657, 839, 436, 720, 355
- Q.2 Write a C program to add a node with data 'X' before a node with data 'Y' in a singly linked list.
- Q.3 Create an AVL tree using the following nodes 10, 6, 11, 12, 1, 7, 0, 2, 3. What will be the resulting AVL tree if node 12 is deleted from above AVL tree?
- Q.4 Consider the following graph -



Find the minimum spanning tree using Prim's algorithm.

- Q.5 (a) Write a recursive program for towers of Hanoi.  
(b) What is a stack? Calculate the following expression -  
 $8 \ 2 \ 3 \wedge / 2 \ 3 \ * + 5 \ 1 \ * -$
-



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3E1138

Roll No. \_\_\_\_\_

Total No. of Pages: 3

3E1138

B. Tech. III - Sem. (Back) Exam., February - 2023

Computer Science & Engineering

3CS4-05 Data Structures and Algorithms

CS, IT

Time: 3 Hours

Maximum Marks: 120

Min. Passing Marks: 42

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 What is stack?

Q.2 Write any four applications of stack.

Q.3 What is queue?

Q.4 What is linked list?

Q.5 Write any two differences between sequential and binary search.

Q.6 What do you mean by radix in radix sort?

Q.7 What is binary search tree?

Q.8 What is AVL tree?

Q.9 What is graph?

Q.10 What is collision in hashing?

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## PART - B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

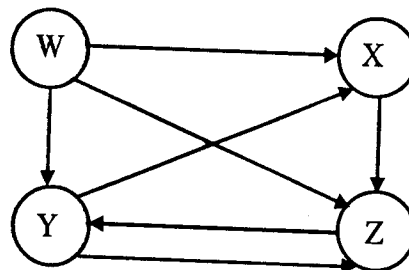
- Q.1 Convert the infix expression  $((A + B)/D) \uparrow ((E - F) * G)$  into postfix expression using stack.
- Q.2 Write algorithms for insert and delete operations on circular queue.
- Q.3 Explain doubly linked list and header linked list with suitable diagrams and also write their any two advantages of each.
- Q.4 Show all steps to search the number 88 in the given sorted array DATA using binary search algorithm. DATA [0:11]: 2, 8, 14, 20, 25, 34, 42, 55, 63, 76, 88, 94
- Q.5 Construct the binary tree whose following traversals are given and find its preorder traversal.

Inorder :        D   B   F   E   A   G   C   L   J   H   K

Postorder :    D   F   E   B   G   L   J   K   H   C   A

Q.6 What is B-tree? Write its properties?

Q.7 Consider the following graph and compute its adjacency matrix and path matrix.



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**PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)** [4×15=60]

**Attempt any four questions**

- Q.1 Show the efficient implementation of two stacks in a single array and write algorithms for push and pop operations.
- Q.2 What is deque and explain its types? Consider the following deque of characters where DEQUE [0:5] is a circular array which is allocated six memory cells –  
Front = 1; Rear = 3; DEQUE: \_\_, A, C, D, \_\_, \_\_  
Perform the operations on the deque in order and show the updated dequeue and values of Front and Rear –
- (a) Insert Rear (F)
  - (b) Delete Rear
  - (c) Delete Rear
  - (d) Insert Front (K)
  - (e) Insert Front (L)
  - (f) Insert Front (M)
  - (g) Delete Front
  - (h) Insert Front (R)
- Q.3 Show all steps to sort the following array using heap sort algorithm –  
NUMBER [0:11]: 44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66
- Q.4 Insert the letters in order J, R, D, G, T, E, M, H, P, A, F, Q into an initially empty binary search tree and from the final tree delete the node M and node D in order.
- Q.5 Insert the following data into a hash table implemented using linear open addressing.  
Assume the buckets to have 3 slots each. Make use of the hash function  $h(X) = X \text{ mod } 9$ .  
{17, 9, 34, 56, 11, 71, 86, 55, 22, 10, 4, 39, 49, 52, 82, 13, 40, 31, 35, 28, 44}
-

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|---------------|---|---|
| <b>3E1204</b> | Roll No. _____  | Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">3</span> |
|               | <b>3E1204</b><br><b>B. Tech. III - Sem. (Main / Back) Exam., February - 2023</b><br><b>Artificial Intelligence &amp; Data Science</b><br><b>3AID4-06 Object Oriented Programming</b><br><b>AID, CAI, CS, IT</b> |   |

**Time: 3 Hours**

**Maximum Marks: 70**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

- Q.1 Write any four characteristics of procedure oriented programming.
- Q.2 Define the different access specifiers.
- Q.3 What are inline functions?
- Q.4 What is function overloading?

- Q.5 What is abstract class?
- Q.6 What is function overriding?
- Q.7 What is operator overloading?
- Q.8 What is dynamic binding?
- Q.9 What are exceptions?
- Q.10 What are templates?

**PART – B**

[5×4=20]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

- Q.1 Explain the characteristics of object oriented programming.
- Q.2 Explain the use of new and delete operators with suitable examples.
- Q.3 Explain the concept of virtual base class with suitable example.
- Q.4 What are static data members and member function? Write it's any two characteristics of each.
- Q.5 Explain the use of following predefined functions with suitable examples–
- (i) put ()                      (ii) get ()
- (iii) getline ()              (iv) write ()
- Q.6 What is this pointer? Explain its any two uses with suitable examples.
- Q.7 Write a program to overload binary plus operator (+) to add two complex number using member function.

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## PART – C

[3×10=30]

### (Descriptive/Analytical/Problem Solving/Design Questions)

#### Attempt any three questions

- Q.1 Write a program to create a class “employee” consist of name, age and salary and member functions for input/output. Enter the records of five faculty and seven staff and print them using array of objects.
- Q.2 What are constructors? Write it’s any five characteristics. Explain different types of constructors with suitable examples.
- Q.3 What is inheritance? Explain different types of inheritance with suitable example.
- Q.4 Write a program with the following -
- (i) A function to read two double type numbers from keyboard.
  - (ii) A function to calculate the division of these two numbers.
  - (iii) A try block to throw an exception when a wrong type of data is entered.
  - (iv) A try block to detect and throw an exception if the condition “divide-by-zero” occurs.
  - (v) Appropriate catch blocks to handle the exceptions.
- Q.5 Write a program that input twenty integer numbers and store even numbers in a file named “Even” and odd numbers in a file named “odd”. Read the contents of each file and print them.

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Roll No. \_\_\_\_\_

Total No. of Pages: 3

**3E1139**

**B. Tech. III - Sem. (Back) Exam., February - 2023**

**Computer Science & Engineering**

**3CS4 – 06 Object Oriented Programming**

**Common For CS, IT**

**Time: 3 Hours**

**Maximum Marks: 120**

**Min. Passing Marks: 42**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 What is class?

Q.2 What is constructor?

Q.3 What is the use of friend function?

Q.4 What do you mean by object oriented Programming?

Q.5 Explain the syntax of inline function.

Q.6 What is abstract class?

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- Q.7 What is Polymorphism?
- Q.8 What are access specifiers in C++?
- Q.9 What is the use of new operator?
- Q.10 What is file?

### PART - B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

- Q.1 Design a class having member functions inside and outside class. Also explain object creation and execution in detail.
- Q.2 Write a program in C++ that display following pattern on the screen -

```
      *
     * * *
    * * * * *
   * * * * * * *
  * * * * *
 * * *
  *

```

- Q.3 What is template? Explain with a suitable example.
- Q.4 Explain function overloading in detail.
- Q.5 Explain the types of constructor with a suitable example.
- Q.6 Write short notes on the following -
  - (a) Pure virtual function
  - (b) Dynamic binding
- Q.7 Explain the difference between C and C++ in detail.



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## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

- Q.1 What is inheritance? Explain its types with suitable example.
- Q.2 What is exception handling? What are the different keywords used to handle the exception in a program?
- Q.3 What is virtual base class? Also explain function overriding in detail.
- Q.4 Write a program to explain the concept of operator overloading.
- Q.5 What do you mean by file handling? Explain different modes for file handling. Also explain at least 5 file handling functions with a suitable example.

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|---------------|--|---|
| <b>3E1205</b> | Roll No. _____   | Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">2</span> |
|               | <b>3E1205</b><br><b>B. Tech. III - Sem. (Main / Back) Exam., February - 2023</b><br><b>Artificial Intelligence &amp; Data Science</b><br><b>3AID4-07 Software Engineering</b><br><b>AID, CAI, CS, IT</b> |   |

Time: 3 Hours

Maximum Marks: 70

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What are the characteristics of good software?
- Q.2 Write down the name of any four object oriented programming languages.
- Q.3 What is SRS?
- Q.4 What do you mean by Actor?
- Q.5 What is difference the between verification and validation?
- Q.6 What do you mean by effort estimation?
- Q.7 What do you mean by space complexity?
- Q.8 Explain Input-Process-Output cycle.
- Q.9 Differentiate application software with system software.
- Q.10 Explain software design documentation.

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## PART – B

(Analytical/Problem solving questions)

[5×4=20]

Attempt any five questions

- Q.1 What are the differences between data flow diagrams and control flow diagram? Explain.
- Q.2 Explain feasibility analysis in detail.
- Q.3 Explain COCOMO estimation model in detail.
- Q.4 Explain unified modeling language in brief.
- Q.5 Explain finite state machine (FSM) models in detail.
- Q.6 Explain LOC and FP estimation in detail.
- Q.7 Explain class and object relationships in detail.

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[3×10=30]

Attempt any three questions

- Q.1 Explain various software development life cycle models in detail.
  - Q.2 Explain various types of diagrams used in software design phase in detail.
  - Q.3 What is role of software requirement analysis phase? How is it done? Explain in detail.
  - Q.4 What do you mean by software project Management? What are issues that we consider in software project management? Explain in detail.
  - Q.5 How can object oriented analysis be done during software development process? Explain in detail.
-

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3E1140

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**3E1140**

**B. Tech. III - Sem. (Back) Exam., February - 2023**  
**Computer Science & Engineering**  
**3CS4 – 07 Software Engineering**  
**Common For CS, IT**

**Time: 3 Hours**

**Maximum Marks: 120**

**Min. Passing Marks: 42**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What are requirement analysis tasks and principles?
- Q.2 What is object modularization?
- Q.3 What is unified modeling language?
- Q.4 What is object oriented analysis modeling?
- Q.5 What is object oriented design concept and method?
- Q.6 What is behavior modeling?
- Q.7 List out various activities that are encompassed by system design process under object oriented design?
- Q.8 What is system level project planning?
- Q.9 What is finite state machine model?
- Q.10 What is sequence diagram in context of UML?

## PART - B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

- Q.1 Description of software design document. What is significance of design document?
- Q.2 What is architectural & procedural software design? Explain.
- Q.3 Explain Incremental Process Model. Justify that it is appropriate for business software system but less appropriate for real time system.
- Q.4 What is SDLC? Explain MIS oriented SDLC model.
- Q.5 What is object oriented design concept? Explain.
- Q.6 Explain class and object relationship in object oriented analysis.
- Q.7 Explain COCOMO estimation model in software project management.

## PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

[4×15=60]

Attempt any four questions

- Q.1 Discuss problem that occur while developing a system and suggest possible solution.
  - Q.2 Explain the system development plan in detail.
  - Q.3 Explain Finite State Machine model.
  - Q.4 Describe how to prepare a software requirement specification document and list possible user and use of SRS for each user.
  - Q.5 Explain use case diagram and state diagram in context of UML.
-

3E1651

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**3E1651**

**B. Tech. III - Sem. (Back) Exam., February - 2023**

**Computer Science & Engineering  
3CS1A Electronic Devices & Circuits  
CS, IT**

**Time: 3 Hours**

**Maximum Marks: 80  
Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

### UNIT- I

- Q.1 (a) What is Hall Effect? Derive the expression for Hall voltage. [8]  
(b) Explain the significance of Fermi level in intrinsic and extrinsic semiconductor. [8]

**OR**

- Q.1 (a) The electron concentration in a sample of uniformly doped n – type silicon at 300°K varies linearly from  $10^{17}/\text{cm}^3$  at  $x = 0$  to  $6 \times 10^{16}/\text{cm}^3$  at  $x = 2 \mu\text{m}$ . Assume a situation that electrons are supplied to keep this concentration gradient constant with time. If electronic charge is  $1.6 \times 10^{19}$  coulomb and the diffusion constant  $D_n=35 \text{ cm}^2/\text{S}$ . Find the current density in the silicon, if no electric field is present. [8]  
(b) Write a short note on Mass Action Law. [8]

## UNIT- II

- Q.2 (a) Explain Ebers-Moll model of transistor. [8]  
(b) Explain the significance of current gain alpha and beta in a transistor, using various current components. [8]

OR

- Q.2 (a) Explain the concept of thermal runaway and Thermal stability. [8]  
(b) What is a transistor? Why is it so called? Draw the input and output characteristics of CB (Common Base) configuration. [8]

## UNIT- III

- Q.3 (a) Explain Miller's theorem. [8]  
(b) Draw the equivalent circuit of a two stage RC-coupled amplifier and analyze it to obtain the expression for gain-bandwidth product. [8]

OR

- Q.3 (a) Explain Emitter follower. [8]  
(b) How can FET be used as a voltage variable resistor? [8]

## UNIT- IV

- Q.4 Distinguish between voltage series feedback and current series feedback. Explain briefly with suitable circuit diagram. [16]

OR

- Q.4 (a) Derive expression for output resistance in voltage series feedback amplifier. [8]  
(b) Give brief account of different feedback topologies. [8]

## UNIT- V

- Q.5 (a) Explain Barkhausen criterion in brief. [8]  
(b) Explain the working of crystal oscillators along with its advantages and disadvantages. [8]

OR

- Q.5 (a) Draw the circuit of BJT Wein bridge oscillator and explain its working. [8]  
(b) Draw a neat diagram and explain the working of Hartley oscillator. [8]

3E1653

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**3E1653**

**B. Tech. III - Sem. (Back) Exam., February - 2023**  
**Computer Science & Engineering**  
**3CS3A Digital Electronics**  
**EE, EX, EC, EI, CS, IT, AI**

**Time: 3 Hours**

**Maximum Marks: 80**  
**Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit.*  
*All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*  
*Units of quantities used/calculated must be stated clearly.*  
*Use of following supporting material is permitted during examination.*  
*(Mentioned in form No. 205)*

1. NIL

2. NIL

### UNIT - I

Q.1 Find the 11's complement of following number - [16]

(a)  $(935)_{12}$

(b)  $(267)_{12}$

OR

Q.1 Simplify the expression using Boolean Algebra - [16]

(a)  $\overline{\overline{AB} + ABC + A(B + \overline{AB})}$

(b) Find the radix value if -

$$(23)_r + (12)_r = (101)_r$$



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## UNIT- II

Q.2 Explain Duality Theorem and De-Morgan's Law with proof. [16]

OR

Q.2 Implement the XOR gate using minimal number of NAND gates. Show that the circuit drawn realizes the XOR gate. [16]

## UNIT- III

Q.3 Compare K-map technique and quine-Mc-Klusky minimization technique. [16]

OR

Q.3 Simplify the following function using tabulation method and verify the result using K-map,  $F = \sum(0, 6, 9, 10, 13) + d(1, 3, 8)$  [16]

## UNIT- IV

Q.4 Explain the Binary Serial and Parallel Address with proper example. [16]

OR

Q.4 Explain diode switching matrix with proper examples. [16]

## UNIT- V

Q.5 Explain following in details - [16]

(a) Flip-flops

(b) Counter

OR

Q.5 Explain following in details - [16]

(a) Registers

(b) Sequential system