

CSE III SEM

Techno India NJR Institute of Technology

Plot-SPLT, Bhamashah (RITCO) Industrial Area
Kaladwas, Udaipur-313003 (Rajasthan)

Total No. of Pages: 4

3E1201

Roll No. _____

3E1201

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

Artificial Intelligence & Data Science

3AID2 – 01 Advanced Engineering Mathematics

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

(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?

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- 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 -

$$\text{Maximize } Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$$

$$\text{Subject to } x_1 + x_2 = 4$$

$$\text{and } x_1, x_2 \geq 0.$$

Q.7 Construct the dual of the following problem -

$$\text{Minimize } Z = x_1 - 3x_2 + 3x_3$$

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

$$\text{and } x_1, x_2, x_3 \geq 0.$$

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	

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.

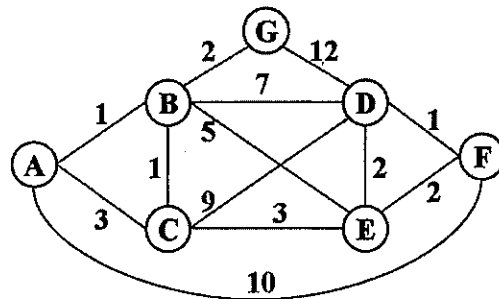
PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

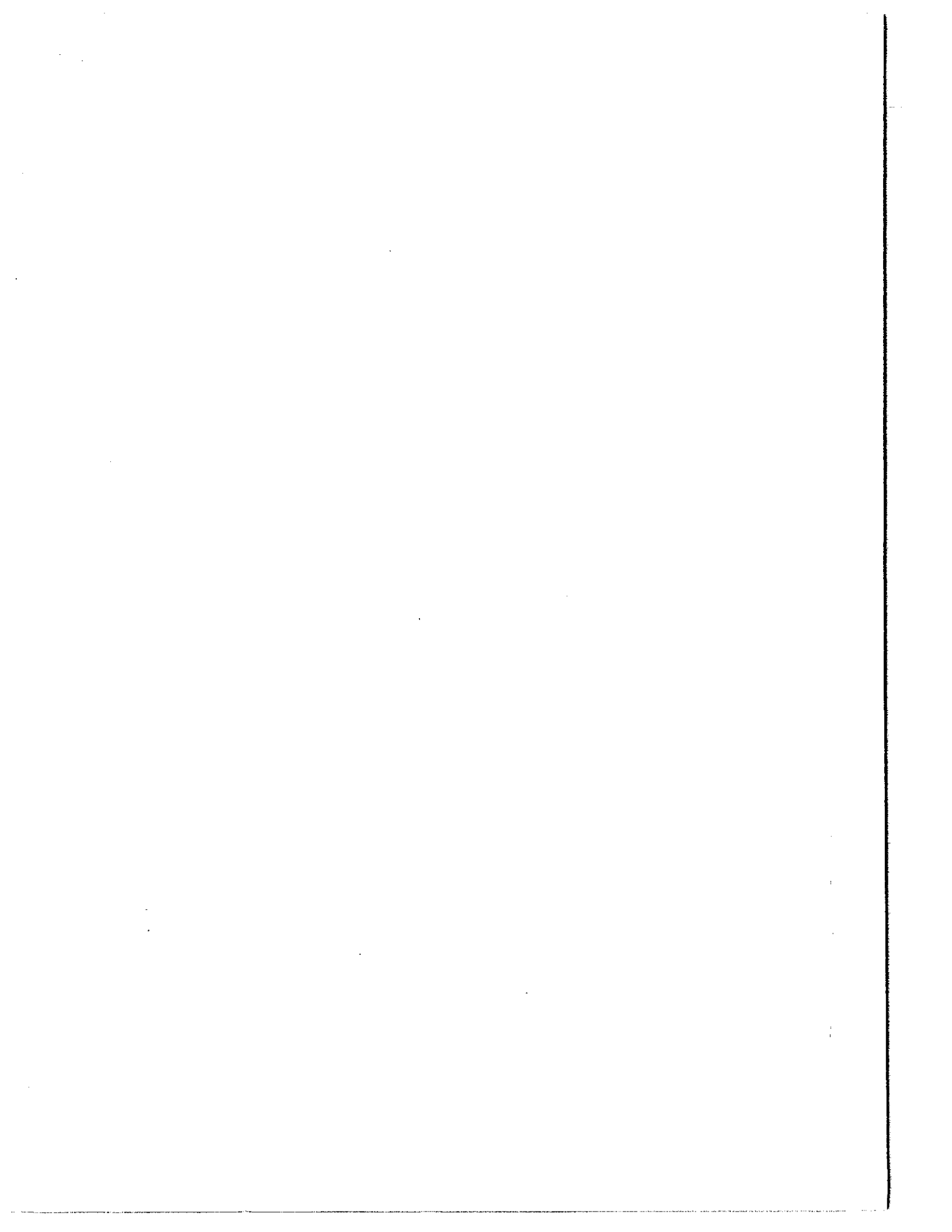
Attempt any three questions

- 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 -
 $8 \ 2 \ 3 \ ^ / \ 2 \ 3 \ * + \ 5 \ 1 \ * -$



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.

[3E1203]

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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

3E1204

Roll No. _____

Total No. of Pages: **3**

3E1204

B. Tech. III - Sem. (Main / Back) Exam., February - 2023
Artificial Intelligence & Data Science
3AID4-06 Object Oriented Programming
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 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.

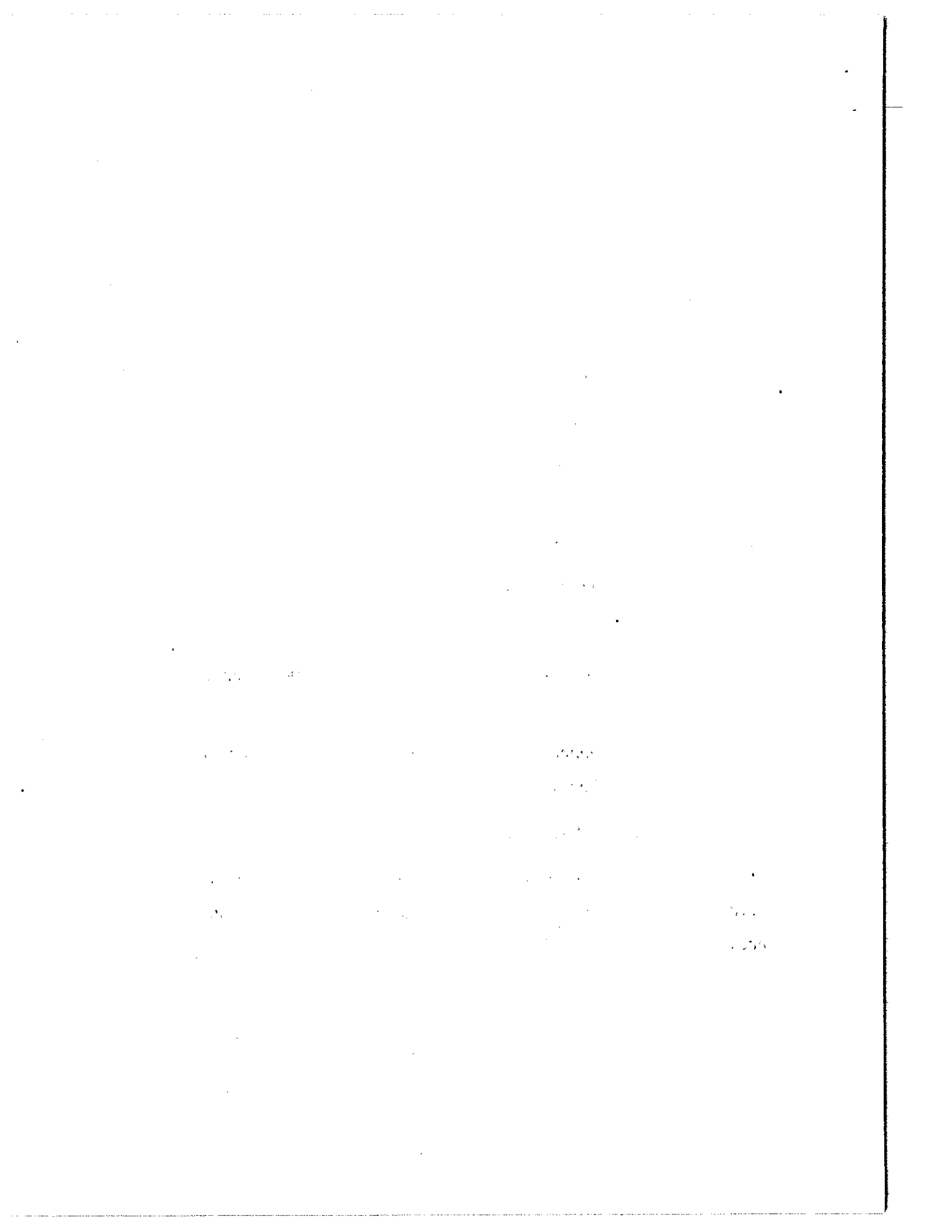
PART – C

[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: **2****3E1205**

B. Tech. III - Sem. (Main / Back) Exam., February - 2023
Artificial Intelligence & Data Science
3AID4-07 Software Engineering
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 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.

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.

3E1250

Roll No. _____

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?

[3E1250]

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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3E1101

Roll No. _____

Total No. of Pages: **3****3E1101****B. Tech. III - Sem. (Back) Exam., February - 2023****Aeronautical Engineering****3AN2-01 Advanced Engineering Mathematics-I****AE, AG, AN, CE, CR, EC, EI, ME, MH, MI****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. Use of non-programmable scientific calculator is allowed in this paper 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 $\Delta^3(x^2 - 1)$ if $h = 1$.
- Q.2 Write Simpson's one – third rule.
- Q.3 Write Adam's predictor – corrector formula.
- Q.4 Write the condition for Newton – Raphson method to be convergent.
- Q.5 Define function of class A.
- Q.6 Find inverse Laplace transform of $\frac{pe^{-ap}}{p^2 - w^2}$, $a > 0$.

- Q.7 Define complex Fourier transform.
- Q.8 State Convolution Theorem for Fourier transform.
- Q.9 Define Z – transform.
- Q.10 Find inverse Z – transform of $\frac{z}{z-a}$, $|z| > a$.

PART – B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

Q.1 Find the value of $\frac{\Delta^2}{E} \sin(x+h) + \frac{\Delta^2 \sin(x+h)}{E \sin(x+h)}$.

Q.2 Find first and second derivatives of function f(x) at x = 7.50 from given data –

x	7.47	7.48	7.49	7.50	7.51	7.52	7.53
f(x)	0.193	0.195	0.198	0.201	0.203	0.260	0.208

Q.3 Use Euler's modified method find y at x = 0.1 by taking h = 0.05, given

$$\frac{dy}{dx} = x^2 + y; y(0) = 1.$$

Q.4 Find inverse Laplace transform of $\frac{p^2}{p^4 - 4a^4}$.

Q.5 Solve ordinary differential equation by using Laplace transform $(D^2 + 1)y = t \cos 2t$;

Given, $y = 0, \frac{dy}{dt} = 0$ when $t = 0$.

Q.6 Find the Fourier sine and cosine transform of –

$$f(t) = \begin{cases} t, & 0 < t < 1 \\ 2 - t, & 1 < t < 2 \\ 0, & t > 2 \end{cases}$$

Q.7 Find Z – transform of $n^2, n \geq 0$.

PART – C

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

Attempt any four questions

Q.1 (a) Use Gauss forward interpolation formula to find $f(128)$ from given data. [7]

x	120	125	130	135	140
f(x)	49225	48316	47236	45926	44306

(b) Find the value of integral $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ using Simpsons 3/8 rule by dividing range into 6 equal parts. [8]

Q.2 (a) Find real root of equation $x^3 - 3x - 5 = 0$ corrected upto 4 decimal place using Newton–Raphson method. [7]

(b) Compute $y(1.4)$, using fourth order Runge–Kutta method with step size $h = 0.2$ given $\frac{dy}{dt} = \frac{t}{y}$, $y(1) = 2$. [8]

Q.3 (a) Evaluate Laplace Transform of function $\sin at - at \cos at + \frac{\sin t}{t}$. [5]

(b) An infinite long string having one end $x = 0$ is initially at rest on the $x -$ axis. The end $x = 0$ undergoes a periodic transverse displacement given by $A_0 \sin \omega t$, $t > 0$. Find the displacement of any point on the string at any time. [10]

Q.4 (a) Find the Fourier cosine transform of e^{-t^2} . [7]

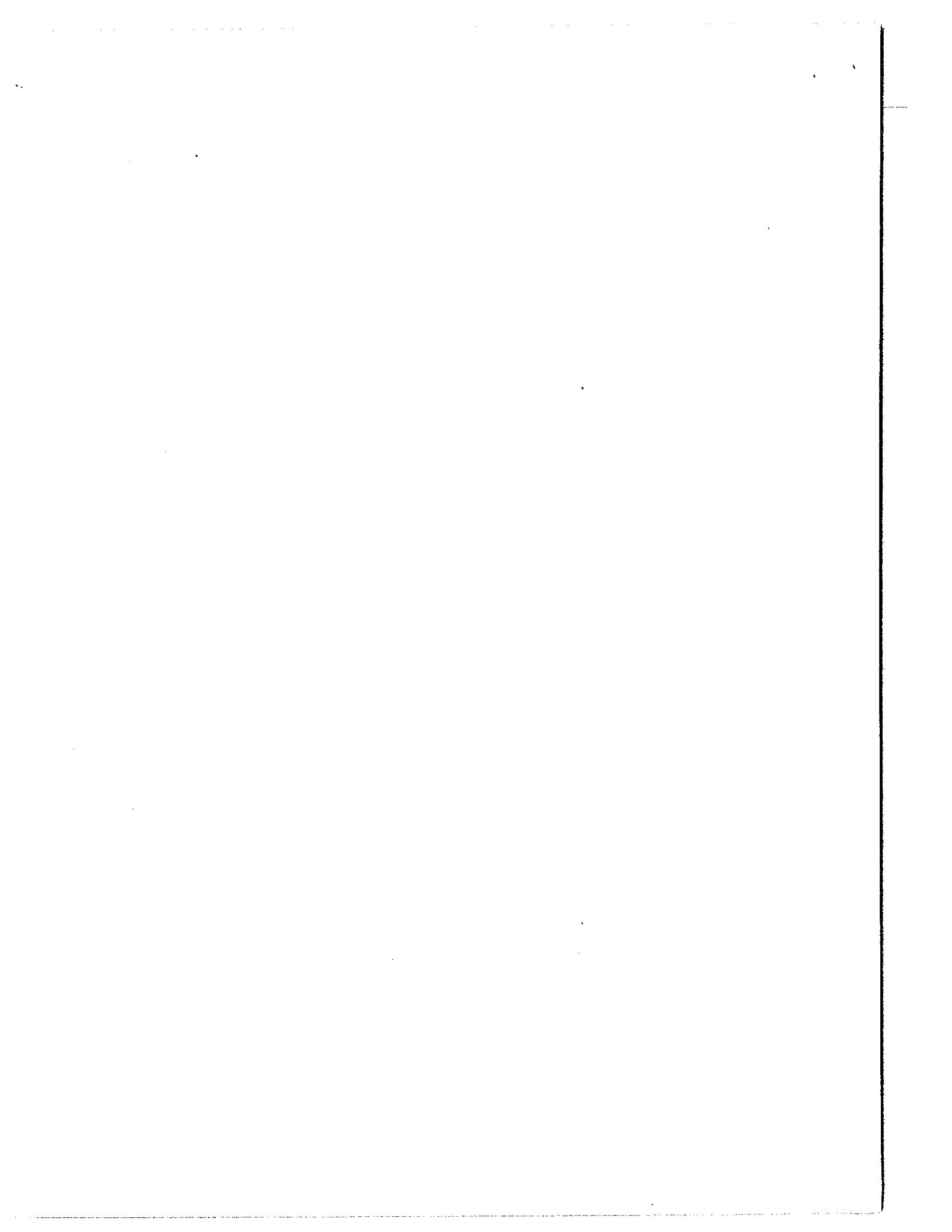
(b) Find inverse Fourier sine transform of $\frac{p}{1+p^2}$. [8]

Q.5 Find inverse Z – transform of $F(z) = \frac{1}{(z-2)(z-3)}$ if region of convergence is –

(a) $|z| < 2$ [5]

(b) $2 < |z| < 3$ [5]

(c) $|z| > 3$ [5]



3E1136

Roll No. _____

Total No. of Pages: 4

3E1136

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

Computer Science & Engineering

3CS2 – 01 Advanced Engineering Mathematics

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 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 $\text{var}(2X + Y - 5)$.

- 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 -

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

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 ₁	M ₂	M ₃	M ₄
J ₁	5	7	11	6
J ₂	8	5	9	6
J ₃	4	7	10	7
J ₄	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 .

3E1137

Roll No. _____

Total No. of Pages: 2

3E1137

B. Tech. III - Sem. (Back) Exam., February - 2023
Computer Science & Engineering
3CS3-04 Digital Electronics
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 State and prove De Morgan's theorem.
Q.2 Convert the following - (i) $(BC)_{16} = ()_{10}$, (ii) $(100011)_2 = ()_{10}$
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.

[3E1137]

Page 1 of 2

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.

3E1139

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?

- Q.7 What is Polymorphism?
Q.8 What are access specifies 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 -

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

```

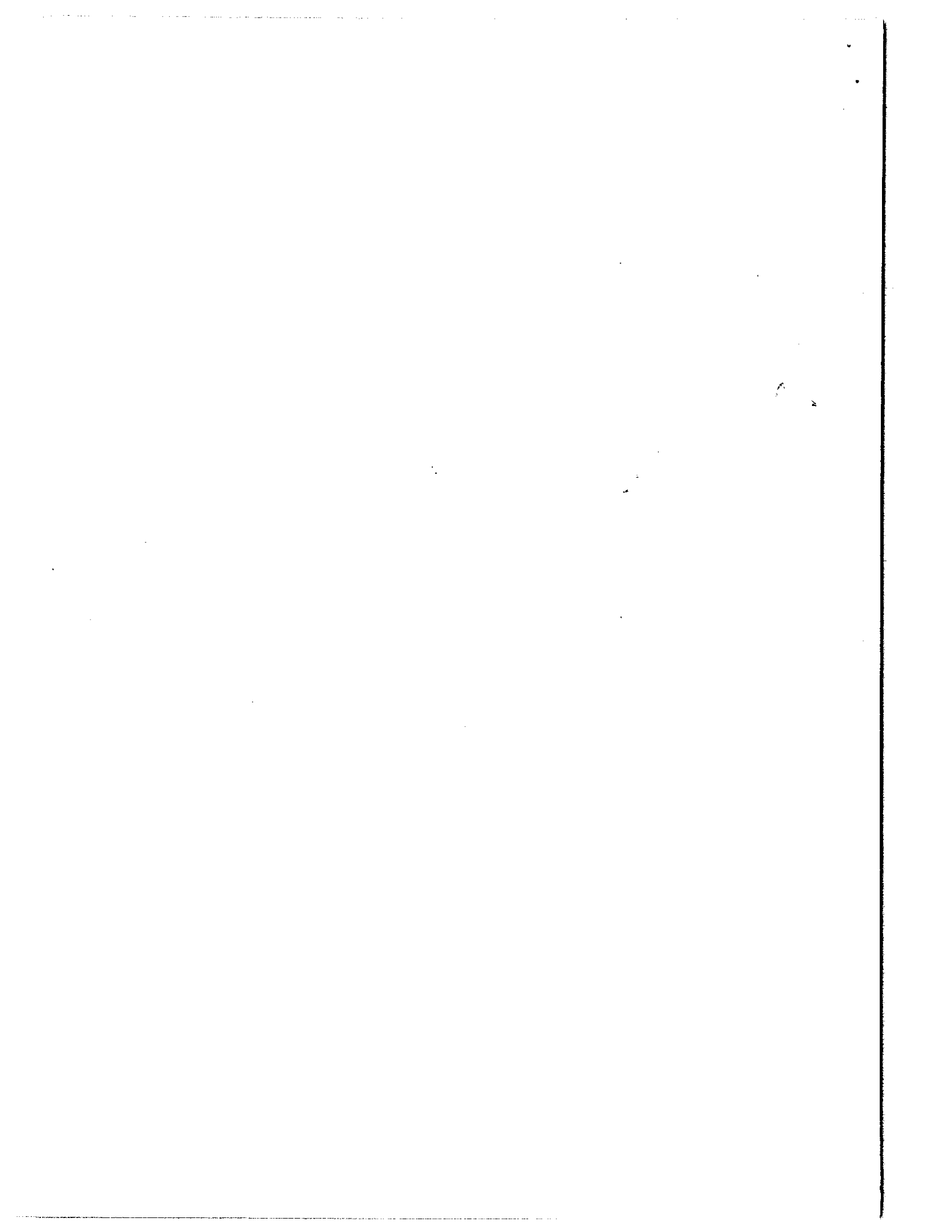
- Q.3 What is template? Explain with a suitable example.
Q.4 Explain function overloading in detail.
Q.5 Explain the types of constructor with a suitable example.
Q.6 Write short notes on the following -
(a) Pure virtual function
(b) Dynamic binding
Q.7 Explain the difference between C and C++ in detail.

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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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.
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