

**B000311(014)**

**B.Tech. (Third Semester) Examination**

**Nov-Dec. 2023**

*common to all branches*

**(Civil Engg. Branch)**

**MATHEMATICS-III**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Attempt all questions. Part (a) is compulsory of each question and attempt any two from (b), (c) and (d) of each questions.***

**Unit-I**

1. (a) Write formula for Laplace transform of a periodic function. 4

**B000311(014)**

**PTO**

(b) (i) Find out  $L(t^2 \sin at)$  4

(ii) Apply Laplace Transform to Evaluate : 4

$$\int_0^{\infty} te^{-2t} \sin 3t dt$$

(c) (i) Evaluate : 4

$$L^{-1} \left\{ \frac{1}{(s^2+1)(s^2+9)} \right\}$$

(ii) Evaluate : 4

$$L^{-1} \left\{ \frac{s+2}{(s^2+4s+5)^2} \right\}$$

(d) Apply Laplace Transform to find solution

$$ty'' + 2y' + ty = \cos t,$$

given that  $y(0) = 1$ . 8

## Unit-II

2. (a) Form a partial differential equation from the given arbitrary function  $f(x^2 + y^2, z - xy) = 0$ . 4

(b) Solve the given equation : 8

$$(x^2 - y^2 - z^2)p + 2xyq - 2xz = 0$$

(c) Solve the following equation 8

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6 \frac{\partial^2 z}{\partial y^2} = y \cos x$$

(d) Apply method of separation of variables to solve

$$4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, \text{ given } u(0, y) = 3e^{-y} - e^{-5y}. \quad 8$$

## Unit-III

3. (a) The probability density function of a continuous random variable is given by

$$f(x) = \begin{cases} \frac{k}{x^3} & , 5 \leq x \leq 10 \\ 0 & , \text{ otherwise} \end{cases}$$

Find value of  $k$ . 4

(b) From a bag containing 3 red and 2 white balls, a man is to draw 2 balls at random without replacement, being promised ₹ 20 for each red ball and ₹ 10 for each white one. Find his expectation. 8

(c) Fit a Poisson distribution to the set of observations :

$x$	:	0	1	2	3	4
$f(x)$	:	122	60	15	2	1

Do all the computation for two decimal places. 8

(d) A certain number of articles manufactured in one batch were classified into three categories according to a particular characteristics, being less than 50, between 50 and 60 and greater than 60. If this characteristics is known to be normally distributed, determine the mean and standard deviation for this batch if 60%, 35% and 5% were found in these categories. 8

#### Unit-IV

4. (a) Find the missing terms in the following data : 4

$x$	:	45	50	55	60	65
$f(x)$	:	3	-	2	-	-2.4

B000311(014)

(b) Apply Newton's Backward interpolation formula and obtain the cubic polynomial which takes the following values : 8

$x$	:	0	1	2	3
$f(x)$	:	1	2	1	10

(c) Apply Stirling's and Bessel's central interpolation formula respectively to find  $f(29)$  and  $f(32)$  from the following data :

$x$	:	20	25	30	35	40
$f(x)$	:	11.4699	12.7834	1.7648	14.4982	15.0463

Do all the calculations for four decimal places. 8

(d) Apply Newton's Divide Difference formula to obtain  $f(x)$  as a cubic polynomial which represents the following data : 8

$x$	:	1	2	7	8
$f(x)$	:	1	5	5	4

#### Unit-V

5. (a) Write Adams-Bashforth predictor - corrector formula, 4

B000311(014)

PTO

- (b) Apply Taylor's series and find out series solution up to four non-zero terms for the given equation

$$\frac{dy}{dx} = xy^{\frac{1}{2}} \text{ and } y(1) = 1$$

Do all the calculation for four decimal places and find numerical solution at  $y(1.2)$ . 8

- (c) Apply Runge Kutta method of fourth order to find out numerical solution of the given differential equation

$$\frac{dy}{dx} + y + xy^2 = 0, \text{ at } y(0.2), \text{ by taking } h = 0.1. \text{ Do}$$

all the calculation for four decimal places. 8

- (d) Apply Milne's predictor corrector method to find numerical solution  $y(0.4)$  for the given equation

$$2 \frac{dy}{dx} = (1+x^2)y^2, \text{ where } y(0) = 1, \text{ also given}$$

$y(0.1) = 1.06, y(0.2) = 1.12 \text{ and } y(0.3) = 1.21.$

Do all the calculation for four decimal places. 8

**B022312(022)**

**B.Tech. (Third Semester) Examination**

**Nov.-Dec. 2023**

**(CSE Branch)**

**DATA STRUCTURE & ALGORITHMS**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Attempt all questions. Part (a) is compulsory  
& Attempt any two parts from (b), (c) and  
(d) of each question.***

**Unit-I**

1. (a) Explain the efficiency of an algorithm in terms of space and time complexity. 4
- (b) Write an algorithm to insert a new node at the end of singly linked list 8

- (c) Given an array and the number find two integers that sum to the given number write an algorithm for this. 8
- (d) Explain sparse Matrices and their representation. 8

### Unit-II

2. (a) Write the step to convert any infix expression to postfix expression. 4
- (b) Write an algorithm for recursive solution to the tower of Hanoi problem for N disks. Also show the diagrammatic execution of algorithm for therefore N = 3 disks and count the number of moves. 8
- (c) What is stack and also explain the PUSH and POP operation of stack with algorithm and diagram. 8
- (d) Convert the following infix expression to postfix notation by showing the operators stack and output string after reading each input token : 8

$$A * B + C * (D - E) - F * G$$

### Unit-III

3. (a) Explain threaded binary tree. 4
- (b) Explain the Huffman algorithm using example : 8
- |      |   |    |    |   |   |   |    |    |
|------|---|----|----|---|---|---|----|----|
| Item | : | A  | B  | C | D | E | F  | G  |
|      | : | 15 | 10 | 5 | 3 | 7 | 12 | 25 |
- (c) What is Tree? Explain the array and linked list representation of Binary Tree. 8
- (d) Write short notes on the following : 8
- (i) String binary tree
  - (ii) Complete binary tree

### Unit-IV

4. (a) Explain the path and adjacency matrix in graph. 4
- (b) Write an algorithm to implement the Kruskal's algorithm also explain with the help of suitable example. 8
- (c) Explain insertion and deletion of a new element in binary search tree along with algorithm. 8
- (d) Explain warshalls algorithm for shortest path in graph. 8

Unit-V

5. (a) Explain the purpose of B and B+ tree. 4
- (b) Explain the Adelson-Velsky and Landis search tree. 8
- (c) Write an algorithm for insertion sort. Also trace the following elements using same. 8
- (d) Sort the following array by using radix sort. 8
- 348, 143, 361, 423, 538, 128, 321, 543, 366

Printed Pages – 3

Roll No. : .....

**B022313(022)**

**B.Tech. (Third Semester) Examination**

**Nov.-Dec. 2023**

**(New Scheme)**

**(Computer Science and Engg. Branch)**

**PRINCIPLES of PROGRAMMING LANGUAGES**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Attempt all questions. Part (a) is of 4 marks and part (b), (c) and (d) are of 8 marks. Part (a) is compulsory and attempt any two parts from (b), (c) and (d).***

**Unit-I**

1. (a) Define external design and explain it in brief.
- (b) Explain the fundamentals of design concepts in detail.
- (c) Define modularity. Explain cohesion in detail with a suitable diagram.

**B022313(022)**

**PTO**



- (d) What do you mean by design notation? Explain Pseudo code with an example.

**Unit-II**

2. (a) Explain the operations of translator in brief.  
(b) Explain factors influencing the evolution of programming languages in detail.  
(c) What do you mean by binding? Explain compile-time binding and run-time binding in detail.  
(d) Write short notes on :  
(i) Virtual Computer  
(ii) Simulated Computer

**Unit-III**

3. (a) Explain logic programming language in brief.  
(b) Explain the comparison & applications of functional programming language and logic programming language in detail.  
(c) What is LISP? Explain the fundamentals of LISP.  
(d) What is PROLOG? Explain control constructs of PROLOG with examples.

**Unit-IV**

4. (a) What do you mean by object? Explain Encapsulation in brief with an example.  
(b) Explain the features of object-oriented programming language in detail.  
(c) What is the basic structure of the C++ program? Write a simple C++ program that demonstrates class and object.  
(d) What do you mean by pointer? Write a comparison between the pointer and reference variable.

**Unit-V**

5. (a) Define the constructor and explain the constructor brief.  
(b) What do you mean by constructor? Explain function overloading with a suitable program.  
(c) Define friend function. Write a C++ program that demonstrates friend function and class.  
(d) Write a short note on :  
(i) Abstract class  
(ii) Inheritance

**B022314(022)**

**B. Tech. (Third Semester) Examination,  
Nov.-Dec. 2023**

**(AICTE Scheme)**

**(CSE Engg. Branch)**

**DIGITAL ELECTRONICS & LOGIC DESIGN**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Part (a) is compulsory from each unit and carry equal 4 marks. attempt any two parts from (b), (c) and (d) from each question and carry equal 8 marks.***

**Unit-I**

1. (a) Convert 10101001 in Gray code.
- (b) State & Prove Demorgan's law.

| 2 |

- (c) Describe NAND and NOR gate as universal gate.
- (d) For 7 bit hamming code received code is 1111101 find error. Use even parity.

**Unit-II**

- 2. (a) Define Fan in & Fan out.
- (b) Describe CMOS NAND gate.
- (c) Describe CMOS NOR gate.
- (d) Describe TTL open collector circuit.

**Unit-III**

- 3. (a) Define the term combinational circuit.
- (b) Describe full adder circuit with diagram & truth table.
- (c) Design  $4 \times 16$  decoder using  $3 \times 8$  decoder.
- (d) Implement the Boolean expression  $F(A, B, C) = \sum m(0, 2, 5, 6)$  using  $4 : 1$  multiplexer.

**Unit-IV**

- 4. (a) Define sequential circuits.

B022314(022)

| 3 |

- (b) Describe S-R Flip-Flop with diagram.
- (c) What is race around condition and also describe master slave Flip-Flop.
- (d) Describe how to convert D flip flop into T flip-flop.

**Unit-V**

- 5. (a) Define State diagram.
- (b) Describe Mealy State Machine.
- (c) Describe Moore State Machine.
- (d) Describe Basic Components of ASM charts.

21801

B022314(022)

**B022315(22)**

**B. Tech. (Third Semester) Examination,  
Nov.-Dec. 2023**

**(CSE Branch)**

**(New Scheme)**

**OPERATING SYSTEMS**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Attempt all questions. Part (a) of each question is compulsory & carry equal 4 marks. Attempt any two from (b), (c) and (d) & carry equal 8 marks.***

**Unit-I**

1. (a) What is an Operating System? What it does as a Resource Manager?
- (b) Briefly explain any 5 services of Operating System, how it provides convenience to the user.

**B022315(22)**

**PTO**

- (c) What are the different types of operating system?  
 (d) Explain Layered Approach of Operating System.

**Unit-II**

2. (a) Draw and briefly explain Process State Transition diagram.  
 (b) Explain Dining philosopher problem with its possible solution.  
 (c) Give a mutual - exclusion solution for Producer-consumer problem of critical section with algorithm and example.  
 (d) What is CPU scheduling? If the different jobs and their arrival time and burst time is given below find the average turnaround time and average waiting time using FCFS and SJF.

Process No.	Arrival time	Burst time
0	0	4
1	1	5
2	2	2
3	3	3
4	4	6

**Unit-III**

3. (a) What is deadlock? Give any real life example of deadlock.  
 (b) What are the four necessary conditions for deadlock occurrence? Explain.  
 (c) Explain various methods of avoid deadlock with example.  
 (d) Determine whether a given system is in a deadlock. Consider the following snapshot of a system :

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P <sub>0</sub>	0	1	0	7	5	3	3	3	2
P <sub>1</sub>	2	0	0	3	2	2			
P <sub>2</sub>	3	0	2	9	0	2			
P <sub>3</sub>	2	1	1	2	2	2			
P <sub>4</sub>	0	0	2	4	3	3			

Answer the following using Banker's algorithm.

- (i) What would be the need matrix?  
 (ii) Is the system in a safe state?

- (iii) If a request from process P1 arrives for (1,0,2) can be granted immediately?
- (iv) Explain various methods for recovery from deadlock.

#### Unit-IV

4. (a) Why do we need paging?
- (b) What is the need of Page replacement? Explain any one page replacement algorithm with suitable example.
- (c) What is Thrashing? State the cause of thrashing.
- (c) Write short notes on :
- (i) Virtual memory
  - (ii) Cache memory

#### Unit-V

5. (a) What are the different operations performed on file?
- (b) Explain free space management and its techniques.
- (c) Describe various file accessing methods with its advantages and disadvantages.
- (d) What do you mean by Input/Output Buffering? Explain with their types.