

**B109311(022)**

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

**Nov.-Dec. 2023**

**(Computer Science & Engineering Branch)**

**(AIML)**

**MATHEMATICS-III**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

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

**Unit-I**

- 1. (a) (i) Write Lagrange's linear equation. 2**  
**(ii) Form the Partial Differential Equation 2**

$$z = f(x + at) + g(x - at)$$

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(b) Using method of separation of variables : 8

$$\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u, \text{ where } u(x, 0) = 6e^{-3x}$$

(c) Solve : 8

$$\frac{\partial^3 z}{\partial x^3} - \frac{4\partial^2 z}{\partial x^2 \partial y} + \frac{4\partial^2 z}{\partial x \partial y^2} = 2 \sin(3x + 2y)$$

(d) Solve : 8

$$x^2(y-z)p + y^2(z-x)q = z^2(x-y)$$

**Unit-II**

2. (a) (i) If  $f(x) = x^2$  is defined in the interval  $[0, 2\pi]$   
find the value of  $a_0$ . 2

(ii) Write Euler's formula. 2

(b) Obtain the constant term and the coefficient of the first sine and cosine terms in the fourier expansion of  $y$  as given in the following table : 8

$x$	0	1	2	3	4	5
$y$	9	18	24	28	26	20

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(c) Expand the function  $f(x) = x \sin x$  as a fourier series in the interval  $-\pi \leq x \leq \pi$ .

Deduce that :

$$\frac{1}{1 \cdot 3} - \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} - \frac{1}{7 \cdot 9} + \dots = \frac{1}{4}(\pi - 2) \quad 8$$

(d) Express  $f(x) = x$  as a half range cosine series in the interval  $0 < x < 2$ . 8

**Unit-III**

3. (a) (i) Find laplace Transform of  $e^{-t} \sin^2 t$ . 2

(ii) Write the properties of Laplace transform. 2

(b) Solve :

$$(D^2 - 3D^2 + 3D - 1)y = t^2 e^t$$

given that  $y(0) = 1, y'(0) = 0, y''(0) = -2$  8

(c) Use convolution theorem evaluate : 8

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

(d) (i) Find  $L^{-1} \left\{ \log \left( \frac{s+1}{s-1} \right) \right\}$ . 4

(ii) Find  $L(t^2 \cos at)$ . 4

**Unit-IV**

4. (a) Define random variable, expectation and variance, probability density function, probability mass function. 4

(b) Find the mean poisson distribution to the set of observations : 8

$x$	:	0	1	2	3	4
$y$	:	122	60	15	2	1

(c) Out of 800 families with 5 children each, how many would you expect to have : 8

(i) 3 boys

(ii) 5 girls

(iii) Either 2 or 3 boys

(d) In a normal distribution 31% of the items are under 45 and 8% over 64. Find its mean and SD of the distribution. 8

**Unit-V**

5. (a) (i) Write formula for Newton's forward and backward interpolation. 2

(ii)  $E = e^{hD}$  2

(b) Find  $f(25)$  correct up to 2 places by using Bessel's Stirling's formula given. 8

$x$	:	20	24	28	32
$f(x)$	:	2854	3162	3544	3992

(c) Using Newton's divided difference formula evaluate  $f(8)$  and  $f(15)$  given : 8

$x$	:	4	5	7	10	11	13
$f(x)$	:	48	100	294	900	1210	2028

(d) Using Lagrange's interpolation formula find  $f(10)$  : 8

$x$	:	5	6	9	11
$f(x)$	:	12	13	14	16

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

**(AICTE Scheme)**

**(AIML CSE Engg. Branch)**

**DATA STRUCTURE and ALGORITHMS**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note :*** Attempt all questions. Each question of part (a) is compulsory and carries 4 marks. Attempt any two parts from (b), (c) and (d) of each question and each carries 8 marks.

**Unit-I**

1. (a) What is an algorithm?
- (b) What is Pseudocode? How to write pseudocode?

[ 2 ]

Also, Write its advantages.

- (c) Write an algorithm to insert a new node at the end of singly linked list with example.
- (d) An array  $X[-15, 10, 15, \dots, 40]$  requires one byte of storage. If the beginning location is 1500 determine the location of  $X[15][20]$ , when the matrix is arranged :
- (i) Column Major Wise
- (ii) Row Major Wise

### Unit-II

2. (a) Define ADT.
- (b) Convert the following Infix expression into Postfix expression.

$$Q = A + (B * C - (D / E \uparrow F) * G) * H$$

- (c) Write an algorithm for a recursive solution to the Tower of Hanoi Problem for N disks. Also show the diagrammatic execution of algorithm via three

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for  $N = 3$  disks and count the number of moves.

- (d) What is Queue? Write operations of queue with algorithm.

### Unit-III

3. (a) Define Header Node.
- (b) Explain in-order and pre-order traversing algorithms using STACK.
- (c) Construct the tree from its given preorder and postorder traversal. Explain the steps involved :
- Preorder : A B D G H K C E F
- Postorder : G K H D B E F C A
- (d) Write short notes on :
- (i) Threaded Binary Tree
- (ii) Extended Binary Tree

### Unit-IV

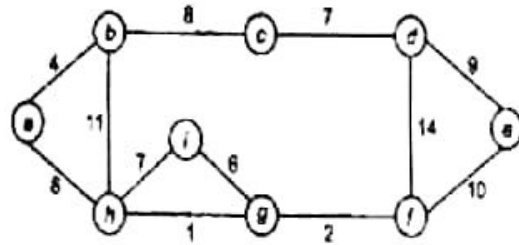
4. (a) What is graph? What are the types of graph?
- (b) What are the graph traversal techniques? Write down

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the algorithms for any one of the techniques.

- (c) Find the minimum spanning tree of the following graph using the Kruskals algorithm.



- (d) Explain the Adjacency and Path matrix with suitable example.

**Unit-V**

5. (a) What is searching?  
 (b) What do you mean by Quick Sort? Explain with example.  
 (c) Explain Bucket Sort with examples. Also, write its algorithm.  
 (d) Write short notes on :  
 (i) AVL trees  
 (ii) Hash function

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

**Nov.-Dec. 2023**

**(Computer Science Engg. Branch)**

**OPERATING SYSTEM**

**(Artificial Intelligence and Machine learning)**

*Time Allowed : Three hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

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

**Unit-I**

1. (a) Explain how an operating system tasks control? 4
- (b) Explain the working and architecture of an operating system in detail. 8



- (c) Describe the distributed computing and parallel computing with suitable example. 8
- (d) Write a note on evolution of OS. 8

**Unit-II**

2. (a) What is the use of process on processing of task? 4
- (b) Describe the objectives of scheduling. Explain the structure of PCB. 8
- (c) For the following table draw a chart illustrating their execution using : 8
- (i) First come first serve
  - (ii) Shortest Remaining Time Next
  - (iii) Round Robin (quantum time = 2 ms)

Process	Arrival Time	Processing Time
P0	0.0	3
P1	1.0	6
P2	4.0	4
P3	6.0	2

- (d) What do you mean by Dining Philosopher method? Explain with suitable diagram. 8

**Unit-III**

3. (a) Write necessary conditions for deadlock. 4
- (b) Explain the method used in deadlock prevention. 8
- (c) What do you mean by deadlock and Starvation? Why traffic deadlock occurred in the given figure. 8



Discuss each of necessary conditions for deadlock in the content of traffic deadlock.

- (d) Write short notes on : 8
- (i) Circular wait
  - (ii) Safe and unsafe state

**Unit-IV**

4. (a) Define resident monitor. 4

- (b) Explain address translation from logical address to physical address. 8
- (c) Consider the following segment table : 8

Segment	Base	Limit
0	219	600
1	2300	14
2	100	100
3	1500	580
4	1000	96

What are the physical addresses for the following logical address :

- 0430
  - 110
  - 2500
  - 3400
  - 4112
- (d) What is page replacement algorithm? Explain any one algorithm with example. 8

## Unit-V

5. (a) Explain various types of buffering. 4
- (b) Describe file allocation methods. 8
- (c) Explain the various disk scheduling algorithm with suitable example. 8
- (d) Write short note on : 8
- (i) File sharing
  - (ii) Virtual O.S.

**B109314(022)**

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

**(CSE : AIML Branch)**

**INTRODUCTION to PYTHON**

***Time Allowed : Three hours***

***Maximum Marks : 100***

***Minimum Pass Marks : 35***

***Note : Attempt all questions. Each question of part  
(a) is compulsory and carries 4 marks.  
Attempt any two parts from (b), (c) and (d)  
of each question and each carries 8 marks.***

**Unit-I**

1. (a) What are the basic features of Python version 3-7?
- (b) What is membership operator in python? Explain

with example.

- (c) How input write a python program to check given character is a vowel or consonant?
- (d) Explain the various data types of Python language with example.

**Unit-II**

- 2. (a) Differentiate between mutable and immutable objects in Python language with example.
- (b) Explain differences between NumPy array and list with example.
- (c) How to create dictionary explain its operation in python?
- (d) Create Narray array and explain its indexing, iterating and slicing operations.

**Unit-III**

- 3. (a) What is the features of pandas in Data Analysis?

- (b) How to create a series in pandas? Explain with example.
- (c) Write a python code to create a Data Frame and also explain its operations.
- (d) How a new column can be added into a Data Frame? What are the different statistical function used in Pandas? Explain with the help of suitable program.

**Unit-IV**

- 4. (a) What is the features of Matplotlib in Python?
- (b) How to generate the Graph by using matplotlib in Python explain with code?
- (c) Explain different types of charts used in matplotlib library in Python?
- (d) Write a program to draw a histogram with example.

**Unit-V**

- 5. (a) What is the use of data analysis in digital era?
- (b) Differentiate between Quantitative and qualitative approaches in data analysis process.

- (c) How do you describe the nature of data? Give example.
- (d) What is data analysis process? Describe various phases of data analysis.

**B109315(022)**

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

**(AICTE Scheme)**

**(CSE : AI & ML Branch)**

**DIGITAL ELECTRONICS and LOGIC DESIGN**

*Time Allowed : Three hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

*Note : Attempt all questions. Part (a) of each question is compulsory and carries 4 marks. Solve any **two** parts from part (b), (c) & (d) and carries 8 marks each. Assume suitable data wherever necessary.*

**Unit-I**

1. (a) (i) 2's complement of the binary number 10110101 is

[ 2 ]

- (ii) Find Gray Code equivalent of Hexadecimal number (A2C)<sub>16</sub>
- (b) Reduce the following expression to the simplest possible POS and SOP forms
- $$F = \sum m (1, 5, 6, 12, 13, 14) + d (2, 4)$$
- (c) What do you understand by error correcting code? Construct (7, 4) hamming code for the message (1000)
- (d) Explain DeMorgan's Theorem with suitable example

### Unit-II

2. (a) (i) Define the term combinational circuit.  
(ii) What is a parity generator?
- (b) Draw the logic diagram of BCD adder and explain its working.
- (c) Implement the logic function
- $$F(A, B, C) = \sum (1, 3, 5, 6)$$
- using a  $4 \times 1$  multiplexer.

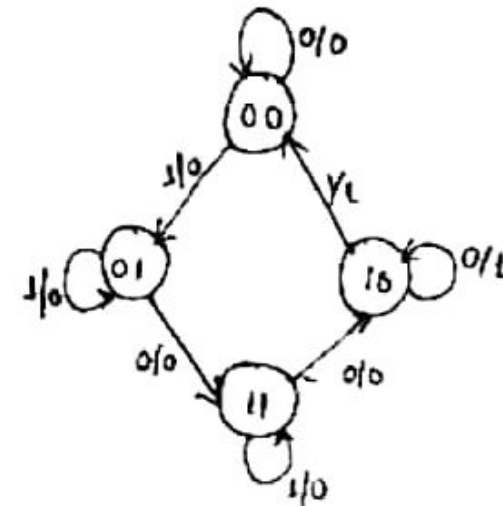
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- (d) Describe full adder circuit. Design a full adder circuit using two half adders.

### Unit-III

3. (a) Convert a JK flip flop into T flip flop.  
(b) Explain the working of BCD ripple counter using JK flip-flop with suitable example.  
(c) Describe the working of a SISO shift register.  
(d) For the given diagram draw the clocked sequential circuit



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**Unit-IV**

4. (a) What is the difference between asynchronous and synchronous circuits?
- (b) Design Hazard free circuit in AND - OR configuration for the logic function :
- $$Y(A, B, C, D) = \sum m(1, 3, 4, 5, 7, 12, 13)$$
- (c) What do you mean by Hazard? Explain types of Hazards.
- (d) What is Hazard free circuit and how to overcome Hazards in asynchronous sequential circuit?

**Unit-V**

5. (a) Explain the terms :
- Propagation delay time
  - Noise immunity
- (b) A combinational circuit is defined by functions :

$$F1(A, B, C) = \sum m(3, 5, 6, 7)$$

$$F2(A, B, C) = \sum m(0, 2, 4, 7)$$

- Implement the circuit with a PLA having three inputs, four product terms, and two outputs
- (c) What are the types of RAMs? Explain the working of static and dynamic RAM.
- (d) Make the Truth? Table for ROM to convert BCD to 7 segment display driver signals