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A   Total Pages **2**

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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.C.A DEGREE EXAMINATION(S), JULY 2021

Course Code: **20MCAT101**

Course Name: **MATHEMATICAL FOUNDATIONS FOR COMPUTING**

**Max. Marks:**   **60**   **Duration:**   **3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Let A, B and C be sets. Show that $\overline{(A \cup (B \cap C))} = (\bar{C} \cup \bar{B}) \cap \bar{A}$

2. Find the sets A and B if A-B ={1,5,7,8}; B-A = {2,10} and A ∩ B = {3,6,9} ?

3. Use Euclidean algorithm to obtain integers x and y satisfying gcd(56,72)= 56x + 72y

4. Solve the recurrence relation $a_n = 7a_{n-1}$;where $n \geq 1$ and $a_2 = 98$

5. How many edges are there in a graph with 20 vertices each of degree 3?

6. Find the adjacency matrix to represent the pseudograph
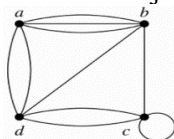
7. Define rank of a matrix? Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 2 & 2 \end{bmatrix}$

8. Determine whether the vectors (1,0,2),(0,1,1) and (2,1,0) are linearly independent or not

9. State the principle of least squares

10. What are the normal equations for fitting of a second-degree parabola $y = ax^2 + bx + c$

PART B
(Answer one full question from each module, each question carries 6 marks)
MODULE I

11. a) Define Reflexive and symmetric closures of a relation   (2)

    b) Let R be the relation on the set {0,1,2,3} containing the ordered pairs (0,1), (1,1), (1,2),   (4)
        (2,0), (2,2) and (3,0). Find the reflexive and symmetric closures of R ?

OR

12. Let R ={ (a,b) / a≤ b } be a relation on a set of integers. Is R a reflexive, symmetric,   (6)
   antisymmetric and transitive relation ? Justify your answer.

MODULE II

13. Solve the following set of simultaneous congruences (6)
$$x \equiv 5(\text{mod } 11)$$
$$x \equiv 14(\text{mod } 29)$$
$$x \equiv 15 (\text{mod } 31)$$

OR

14. Solve the non-homogeneous recurrence relation $a_{n+2} - 4a_{n+1} + 3a_n = -200$; where (6) $n \geq 0$, $a_0 = 3000$, $a_1 = 3300$
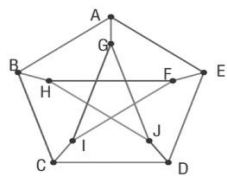
MODULE III

15. Find the length of the shortest path between a and z in the weighted graph using Dijkstra's (6) algorithm
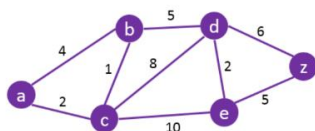
OR

16 Determine whether the Petersen graph is planar? (6)

MODULE IV

17. a) Show that the following system of equations is consistent (4)
$$x + 2y + z = 3$$
$$2x + 3y + 2z = 5$$
$$3x - 5y + 5z = 2$$
$$3x + 9y - z = 4$$

   b) Solve the above system of equations (2)

OR

18. a) Find the principal axes form of the quadratic $x^2 - 12xy + y^2 = 70$? (4)

   b) Find out what kind of a conic section is given by the above quadratic form? (2)

MODULE V

19. Fit a straight-line $y = ax + b$ to the following data (6)

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

OR

20. Find the rank correlation coefficients for the following data (6)

X	15	20	28	12	40	60	20	80
Y	40	30	50	30	20	10	30	60

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