Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.C.A DEGREE EXAMINATION (Regular), FEBRUARY 2022
(2021 SCHEME)

Course Code: 21CA101

Course Name: Mathematical Foundations for Computing

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

PART A

(Answer all questions. Each question carries 3 marks)

1. Prove that $\overline{A \cup B} = \overline{A} \cup \overline{B}$.
2. Let f_1 and f_2 be functions from **R** to **R** such that $f_1(x) = x^2$ and $f_2(x) = x - x^2$. What are the functions $f_1 + f_2$ and $f_1 f_2$.
3. Using Euclidean algorithm find $\gcd(12378, 3054)$.
4. Show that, $-56 \equiv -11 (mod\ 9)$.
5. How many edges are there in a graph with 10 vertices each of degree six?
6. Draw the complete bipartite graph $K_{4,3}$
7. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$
8. Find the characteristic roots (eigen values) of $\begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$
9. Define Pearson coefficient of correlation.
10. State the principle of least squares.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

11. a) Define a partially ordered set. (2)
    b) Show that the set of subsets of a given set (its power set) ordered by inclusion is a partially ordered set. (4)

OR

12. a) Define Reflexive and symmetric closures of a relation. (2)
    b) Let $R = \{(1,2), (1,3), (2,2)(2,4)(4,3)\}$ be a binary relation on the set $A = \{1, 2, 3, 4\}$. Find the reflexive and symmetric closures of R. (4)

MODULE II

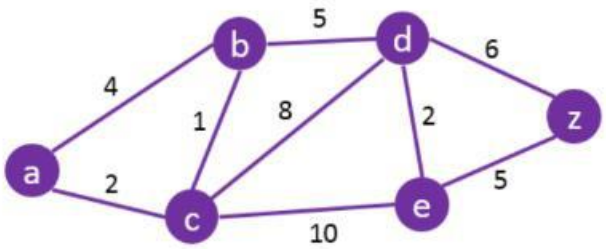
13. Find the remainder obtained by dividing the sum $1! + 2! + 3! + \cdots + 99! + 100!$ by 12. (6)

OR

14. Solve the non-homogeneous recurrence relation $a_{n+2} + 5a_{n+1} + 6a_n = 56(5^n)$, given $a_0 = 4,\ a_1 = 0$. (6)

MODULE III

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



(6)

OR

16. a) Draw a graph with the adjacency matrix $\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$ (3)

b) Define planar graph? Is K_4, the complete graph on *4* vertices is planar? (3)

MODULE IV

17. Solve the system $x_1 + 2x_2 + x_3 = 2$
$3x_1 + x_2 - 2x_3 = 1$
$4x_1 - 3x_2 - x_3 = 3$
$2x_1 + 4x_2 + 2x_3 = 4$ (6)

OR

18. If $A = \begin{pmatrix} 7 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 7 \end{pmatrix}$, then find an orthogonal matrix P such that $P^{-1}AP$ diagonal. (6)

MODULE V

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

X	1	2	3	4	5	6	7
Y	7	13	19	25	32	40	50

(6)

OR

20. Find the regression lines for the following data on *X* and *Y*.

X	*65*	*66*	*67*	*67*	*68*	*69*	*70*	*72*
Y	*67*	*68*	*65*	*68*	*72*	*72*	*69*	*71*

(6)

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