THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

Course Code : MAS 1433/1559
Course Title : Discrete Mathematics **Time : 3 Hrs**
Max : 75 Marks

Answer Any FIVE questions : $\mathbf{5 \times 15 = 75}$

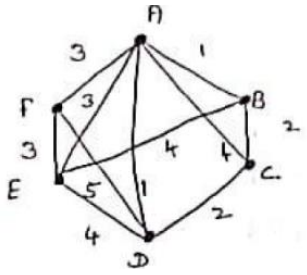
1. (i) Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, A = {1, 3, 5, 7, 9} and B = {2, 4, 6, 8, 10} Find $A \cup B,\ A \cap B, A\Delta B\ and\ A^C$
   (ii) Show that $P \vee (\sim P \rightarrow (Q \vee (\sim Q \rightarrow R)))$ is a tautology.

2. Solve the following system of equation using crammer's Rule
   $x + 2y - z = 2,\ 3x - 4y + 2z = 1,\ -x + 3y - z = 4.$

3. (i) Show that the following vectors (2,-3,1), (0,1,2), (1,1,2) forms a basis for $V_3(R)$.
   (ii) Out of 6 consonants and 3 vowels how many words can be made each containing 3 consonants and 2 vowels.

4. (i) In R-{1} we define $a * b = a + b - ab$. Show that (R-{1}, *) is a group.
   (ii) Draw the parsing tree for the formula $\big((p \rightarrow (\sim q)) \rightarrow (p \wedge q)\big)$

5. (i) Find the number of ways in which 5 boys and 3 girls may be arranged in a row so that no two girls are together.
   (ii) Find the minimal scanning tree for the given graph using Kruskal's Algorithm.



6. Prove that $R \times R$ is a vector space over R under addition and scalar multiplication defined by $(x_1, x_2) + (y_1, y_2) = (x_1 + y_1,\ x_2 + y_2)$ and $\alpha\,(x_1, x_2) = (\alpha x_1, \alpha x_2)$

7. Explain the following definitions with suitable graph examples.
   (a) Cut vertex (b) Cycle (c) Walk (d) Path (e) Trail