INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

B.Tech III Semester End Examinations (Regular), February – 2021
Regulation: IARE–R18
DISCRETE MATHEMATICAL STRUCTURES

Time: 3 Hours   (CSE | IT)   Max Marks: **70**

Answer any Four Questions from Part A
Answer any Five Questions from Part B

PART – A

1. Show that $(p \rightarrow (q \rightarrow r)) \rightarrow ((p \rightarrow q) \rightarrow (p \rightarrow r))$ is a Tautology using truth table. **[5M]**

2. Draw the Hasse diagram representing the positive divisors of 36. **[5M]**

3. State Multinomial theorem and find the coefficient of $w^2 x^2 y 2 z^2$ in the expansion of $(w + x + y + z + 1)^{10}$. **[5M]**

4. Identify the co-efficient of x^{15} of $x^3(1 + x)^4$ / (1-x) . **[5M]**

5. Write a short notes on i) Matrix representation ii) Incidence matrix iii) Linked list representation of graph **[5M]**

6. Show that $(P \wedge Q) V (\neg P \wedge Q) V (P \wedge \neg Q) V (\neg P \wedge \neg Q) \Leftrightarrow T$. **[5M]**

7. If the relations R and S are compatibility relations, prove that $R \cap S$ is compatibility relation. **[5M]**

8. Find the generating function for the below sequences: i)1^2, 2^2, 3^2.... ii) 0,1,2,3,4 ..... **[5M]**

PART – B

9. State tautology and contradiction. Verify whether the implications are tautology or contradiction using truth tables.

   i)$[P \rightarrow (Q \rightarrow R)]$

   ii) $[(P \rightarrow Q) \wedge (Q \rightarrow R)] \rightarrow (P \rightarrow R)$ **[10M]**

10. Write the negations of the following statements

    i) Jan will take a job in industry or go to graduate school

    ii) James will bicycle or run tomorrow

    iii) If the processor is fast then the printer is slow **[10M]**

11. If f(x) = x + 1; g(x) = $2x^2 + 3$ for real number , find

    i) f o g

    ii) g o f

    iii) f o f

    iv) g o g **[10M]**

12. Let $(L, \leq)$ be a lattice, * and $\oplus$ be two operations such that a * b = glb{a,b}, a$\oplus$b = lub{a,b}.Prove that both * and $\oplus$ satisfy Commutative law, Associative law, Absorption law and Idempotentlaw. **[10M]**

13. Suppose that the license plates of a certain state require 3 English letters followed by 4 digits

    i) How many different plates can be manufactured if repetition of letters and digits are allowed?

    ii) How many plates are possible if only the letters can be repeated?

    iii) How many are possible if only the digits can be repeated?

    iv) How many are possible if no repetitions are allowed at all? **[10M]**

14. Suppose that 200 faculty members can speak Telugu and 50 can speak Hindi, while only 20 can speak both Telugu and Hindi. How many faculty members can speak either Telugu or Hindi? Use principle of inclusion-exclusion. **[10M]**

15. Solve the recurrence relation $a_n = 7a_{n-1} - 10a_{n-2}$ with $a_0 = 2$ and $a_1 = 3$ for n $\geq$ 2. **[10M]**

16. Find the complete solution to the homogeneous recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 4n$ for n$\geq$2. **[10M]**

17. Let a graph G is a 4-regular connected planar graph having 16 edges. Find the number of regions of G. **[10M]**

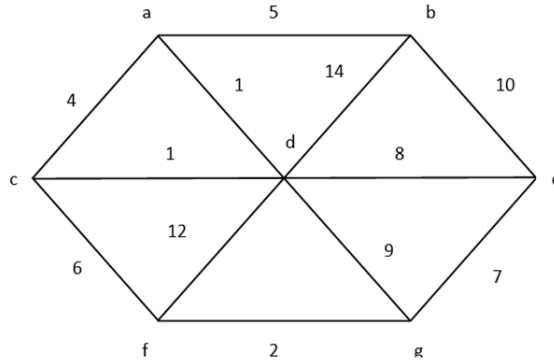18. Construct the minimal cost spanning tree for the above graph shown in Figure 1 using Prim's algorithm? **[10M]**

Figure 1

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