Register No: ……………………   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
SECOND SEMESTER INTEGRATED MCA DEGREE EXAMINATION(R,S), MAY 2024
Integrated MCA
(2020 SCHEME)

Course Code   :   **20IMCAT104**

Course Name   :   **Introduction to Discrete Mathematics**

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

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

1. Using truth table check whether the argument is valid or not, $p, p \to q \implies p$.

2. Construct a truth table for $(p \vee q) \to (p \wedge q)$.

3. Among 100 people, how many of them have birthday in same month.

4. Use mathematical induction to prove $2^n < n!$ for all positive integers n with $n \geq 4$.

5. Find the least common multiple of
   a) $2^3.5^5.7^2$, $2^4.3^2$
   b) $2^2.3^3.5^5$, $2^5.3^3.5^2$.

6. What are the quotient and remainder when
   a) 101 is divided by 11
   b) 19 is divided by 7.

7. State the necessary and sufficient condition for Euler path and Euler circuit.

8. State Ores theorem.

9. Define m-ary tree and full m-ary tree with example.

10. Define minimum spanning tree.

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

11. Show that $(p \vee q) \wedge (p \vee r)$ is neither tautology nor contradiction.   6

OR

12. Translate each of the statements into propositions using predicates, quantifiers and logical   6
   operators.
   $P(x) : x \ is \ perfect$
   $C(x) : x \ is \ your \ friend$
   $Domain : all \ people$
   a) None is perfect
   b) Not everyone is perfect
   c) At least one of your friend is perfect
   d) Everyone is your friend and is perfect
   e) Not everyone is your friend or someone is not perfect.

MODULE II

13. Use mathematical induction to prove the sum of finite number of terms of a geometric   6
   progression $a + ar + ar^2 + \ldots + ar^n = \frac{ar^{n+1}-a}{r-1}, n \geq 0, n \in \mathbb{Z}$.
OR

14. Use <u>mathematical induction</u> to prove the generalisation of one of De- morgan's law for   6
sets, $\overline{(A_1 \cap A_2 \cap \ldots \cap A_n)} = \bar{A}_1 \cup \bar{A}_2 \cup \ldots \cup \bar{A}_n$.
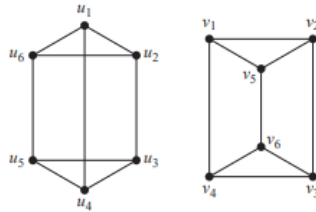
MODULE III

15. Using Euclidean algorithm find the $gcd(360, 294)$ and also find the integers x and y   6
such that $gcd(360, 294) = 360x + 294y$.

OR

16. Find the solution of $3x \equiv 4(mod7)$.   6

MODULE IV
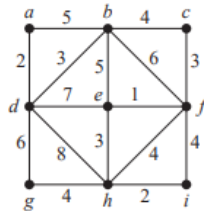
17. Determine whether the given pair of graphs is isomorphic   6

OR

18. Find the degree sequence of each of the following graphs.   6
    a) K_4 b) C_4 c) W_4 d) $K_{2,3}$ e) Q_3

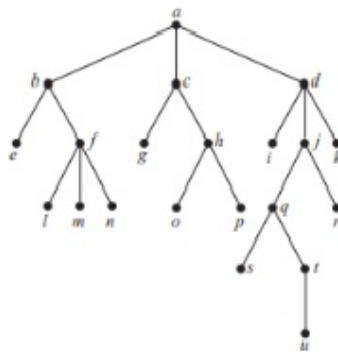**MODULE V**

19. Use Prim's algorithm to find a minimum spanning tree for the given weighted graph.   6

OR

20.   6

Answer these questions about the rooted tree illustrated
  (i) Which vertex is the root?
  (ii) Which vertices are internal?
  (iii) Which vertices are leaves?
  (iv) Which vertices are children of j?
  (v) Which vertex is the parent of h?
  (vi) Which vertices are siblings of o?
  (vii) Which vertices are ancestors of m?
  (viii) Which vertices are descendants of b?

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