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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER INTEGRATED MCA DEGREE EXAMINATION (R), MAY 2023
(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. Describe the logical operator disjunction with truth table.
2. Find the truth value of the following:
   a. 2+3 =6 if and only if 1+1 =7
   b. If 2+3=4 then 1+1=2
   c. 1+1=2 and 2+1=4
3. State Pigeon hole principle.
4. Among 100 students in a class, how many were born in the same month?
5. State Chinese Remainder Theorem.
6. Find gcd(-8,-36).
7. Explain pendant and isolated vertex with example.
8. State Dirac's Theorem.
9. Define tree with example.
10. Differentiate between rooted tree and binary tree.

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

11. Show that the premises "If you send me an e-mail message, then I will finish writing the program," "If you do not send me an e-mail message, then I will go to sleep early," and "If I go to sleep early, then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed."   (6)

OR

12. Show that p→ (q ∨ r) ≡ (p → q) ∨ (p→ r) by using truth table.   (6)

MODULE II

13. Use mathematical induction to prove that the sum of first n odd positive integers is n^2.   (6)

OR

14. Use mathematical induction to show that $H_{2^n} \geq 1 + \frac{n}{2}$ whenever n is a non-negative integer, where the harmonic number $H_j = 1 + \frac{1}{2} + \frac{1}{3} + \cdots.. + \frac{1}{j}$.   (6)
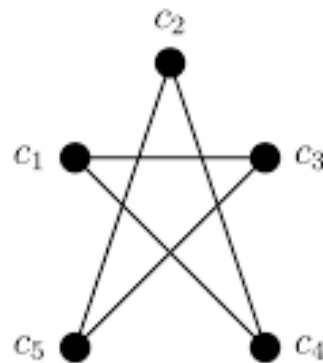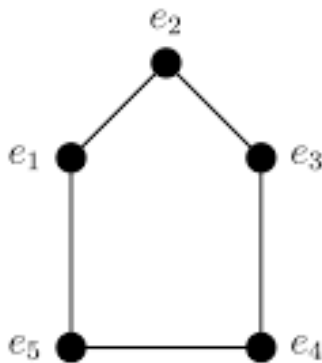
MODULE III

15. Use Euclidean algorithm to find gcd(56, 72) and obtain the integers x and y such that gcd(58, 72)= 56 x + 72y.   (6)

OR

16. Find the smallest positive integer which is a solution of the system of congruence.
x ≡ 2 mod(3)
x ≡ 3 mod (5)
x ≡ 2 mod (7)
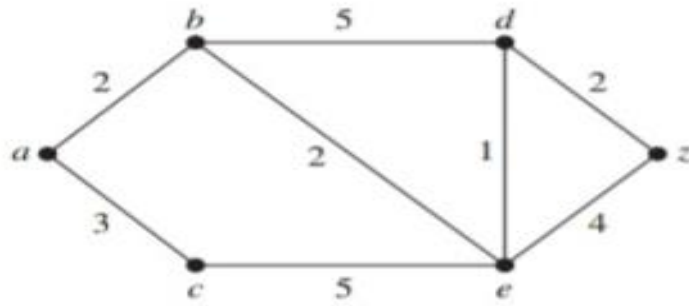Using Chinese remainder theorem.   (6)

MODULE IV

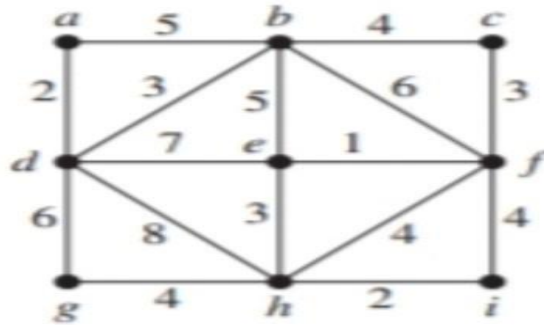17. Show that the following graphs are isomorphic

   (6)

OR

18. Use Dijkstra's algorithm to find the length of the shortest path between a and z from the following graph   (6)
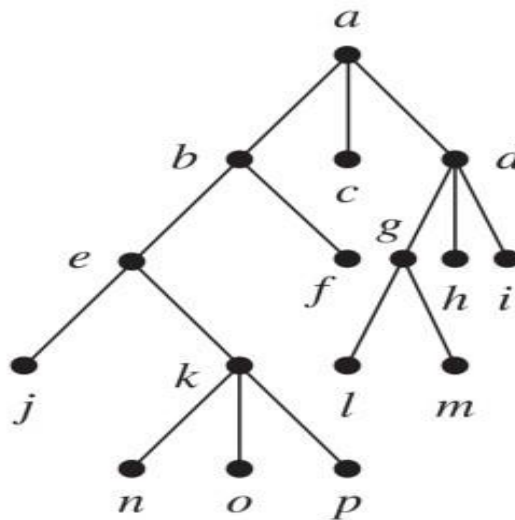
MODULE V

19. Use Kruskal's algorithm to find a minimum spanning tree in the graph shown below

(6)

OR

20. Find the inorder and post order traversal of the following tree

(6)

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