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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION (R), JULY 2022

(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. What are the contrapositive, the converse, and the inverse of the conditional statement "The home team wins whenever it is raining?"
2. Let P (x) be the statement "x + 1 > x." What is the truth value of the quantification ∀x P (x), where the domain consists of all real numbers?
3. Explain the principle of mathematical induction.
4. How many students must be in a class to guarantee that at least two students receive the same score on the final exam, if the exam is graded on a scale from 0 to 100 points?
5. Find an inverse of 5 modulo 9
6. Determine the gcd and lcm of $(3^7 5^3 7^3, 2^{11} 3^5 5^9)$
7. State the hand shaking theorem.
8. Use an adjacency matrix to represent the graph shown in Figure

9. Define tree and rooted tree and give an example of rooted tree.
10. Define m ary tree, full m ary tree and binary tree .

PART B

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

MODULE I

11. Using truth table show that ¬(p ∨ q) and ¬p ∧ ¬q are logically equivalent. (6)

OR

12. Derive the conclusion for the hypotheses 'If it is sunny, then we will go swimming', and 'we will not go swimming' using suitable rule of inference. (6)

MODULE II

13. Show that if n is a positive integer, then $1 + 2 + \cdots + n = \frac{n(n+1)}{2}$ (6)

OR

14. How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen? (6)

MODULE III

15. Find the greatest common divisor of 414 and 662 using the Euclidean algorithm. (6)

OR

16. Find all solutions to the system of congruence

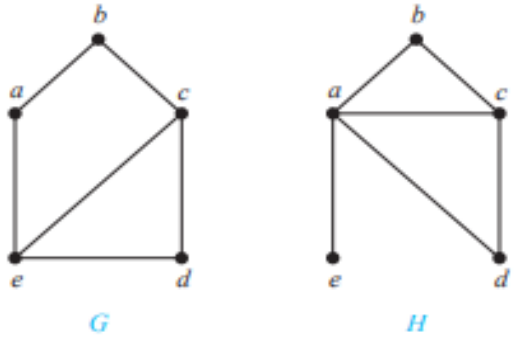
$$x \equiv 2(\,mod\ 3)$$
$$x \equiv 3(mod\ 5)$$
$$x \equiv 2(mod\ 7)$$

(6)

using Chinese Remainder Theorem

MODULE IV

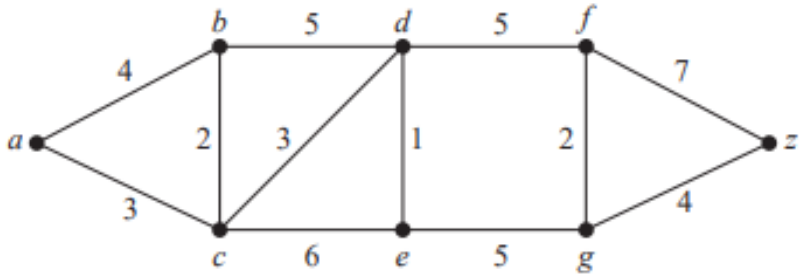
17. Determine whether the following graphs are isomorphic



(6)

OR

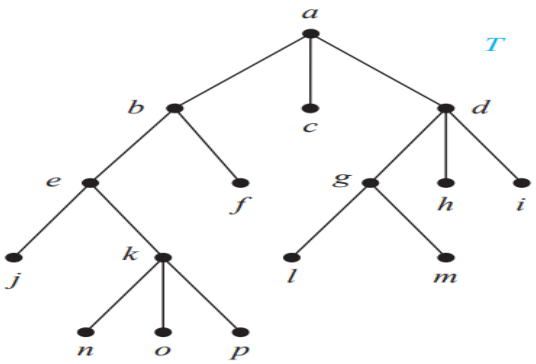
18. Find the length of a shortest path between a and z in the weighted graph given below.



(6)

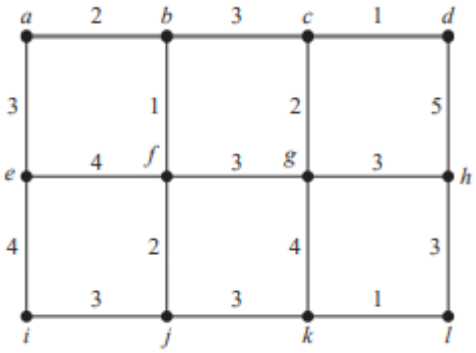
MODULE V

19. In which order does an in order traversal visit the vertices of the ordered rooted tree T in Figure (6)



OR

20. Use Prim's algorithm to design a minimum-cost communications network connecting all the computers represented by the graph in Figure



(6)

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