

Code No:841AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MCA I Semester Examinations, April/May - 2019

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Time: 3hrs

Max.Marks:75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

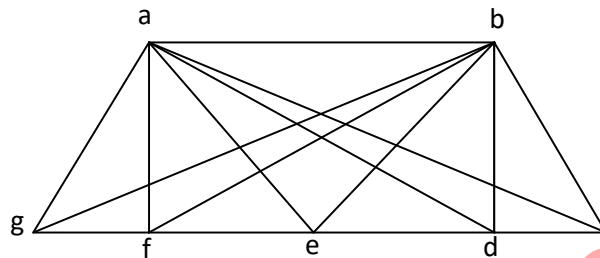
**PART - A****5 × 5 Marks = 25**

- 1.a) Construct the truth table  $(P \wedge Q) \vee (Q \wedge R) \vee (P \wedge \sim R)$ . [5]
- b) Let  $G$  be the set of real numbers not equal to -1 and be defined by  $a * b = a + b + ab$ .  
Prove that  $\langle G, * \rangle$  is an abelian group. [5]
- c) How many integers between 1 and 100 have a sum of digits of integer numbers equal to 10? [5]
- d) Find the particular solution for the following difference equation  $a_n + 5a_{n-1} + 6a_{n-2} = 42.4^n$  [5]
- e) What do you mean by Isomorphic graph? When will you say that two graphs are isomorphic? [5]

**PART - B****5 × 10 Marks = 50**

2. Obtain the Principal Disjunctive normal form of  $P \rightarrow [(P \rightarrow Q) \wedge \sim(\sim Q \vee \sim P)]$  [10]
- OR**
3. Show that the following *argument is valid*. If today is Tuesday, I have a test in Mathematics or Economics. If my Economics professor is sick, I will not have a test in Economics. Today is Tuesday and my Economics professor is sick. Therefore I have a test in Mathematics. [10]
  4. Consider the group  $G = \{1, 2, 4, 7, 8, 11, 13, 14\}$  under multiplication modulo 15. Construct the multiplication table of  $G$  and verify whether  $G$  is cycle or not. [10]
- OR**
- 5.a) Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$ , where  $\mathbb{R}$  is the set of real numbers. Find  $f \circ g$  and  $g \circ f$ , where  $f(x) = x^2 - 2$  and  $g(x) = x + 4$ . State whether these functions are injective, surjective, and bijective.
  - b) Define Lattice and write various properties of Lattice. [5+5]
  6. Using binomial identities evaluate the sum  $1.2.3 + 2.3.4 + \dots + (n-2)(n-1)n$ . [10]
- OR**
7. Suppose there are 15 red balls and 5 white balls. Assume that the balls are distinguishable and that a sample of 5 balls is to be selected.
    - a) How many samples of 5 balls are there?
    - b) How many samples contain all red balls?
    - c) How many samples contain 3 red balls and 2 white balls?
    - d) How many samples contain at least 4 red balls? [10]

8. Solve the recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  for  $n \geq 2$  where  $a_0 = 10$  and  $a_1 = 41$ . [10]
- OR**
9. Explain and illustrate various ways of solving the recurrence relation. [10]
10. State and explain the 4-color problem for planar graphs. [10]
- OR**
11. What is planar graph? Show that following graph is planar. [10]



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