

Code No: 133BC

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, November/December - 2017****MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

(Common to CSE, IT)

**Time: 3 Hours****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****(25 Marks)**

- 1.a) Represent the proposition "If you have the fee then you miss the final examination" into symbolic form and also its negation. [2]
- b) Provide a proof by direct method of the following statement, "If  $x$  is odd then  $x^2$  is odd". [3]
- c) Differentiate partial ordering and total ordering relations. [2]
- d) Define lattice and write its properties. [3]
- e) Find out how many 5-digit numbers greater than 30,000 can be formed from the digits 1,2,3,4 and 5. [2]
- f) In how many ways can we draw a heart or queen from a pack of cards. [3]
- g) Define recurrence relation and explain recurrence relation for towers of Hanoi. [2]
- h) Solve recurrence relation  $a_n - 4a_{n-1} + 4a_{n-2} = 0$ ,  $a_0 = 0$ ,  $a_1 = 1$ . [3]
- i) Define complete graph and wheel graph. [2]
- j) Define planar graph and write conditions for testing planarity of the graph. [3]

**PART-B****(50 Marks)**

- 2.a) State and explain the rules that can generate a well formed formula.
- b) Show that  $R \rightarrow S$  can be derived from premises,  $P \rightarrow (Q \rightarrow S)$ ,  $(\sim R \vee P)$  and  $Q$ . [5+5]

**OR**

- 3.a) Define PDNF and find PDNF for  $(\sim P \leftrightarrow R) \wedge (Q \leftrightarrow P)$ .
- b) Prove or disprove the validity of the following arguments using the rules of inference, All men are fallible, All kings are men, Therefore, all kings are fallible. [5+5]

- 4.a) If  $a, b$  are any two elements of a group  $(G, \cdot)$  which commute, show that  $a^{-1}$  and  $b$  commute,  $b^{-1}$  and  $a$  commute,  $a^{-1}$  and  $b^{-1}$  commute.
- b) Let  $A = \{1, 2, 3, 4, 6, 8, 12, 24\}$ , show that the relation 'divides' is partial ordering on  $A$  and draw Hasse diagram. [5+5]

**OR**

- 5.a) Let  $G = \{-1, 0, 1\}$ , verify whether  $G$  forms a group under usual addition.
- b) Show that the sets of even numbers and odd numbers are both recursive. [5+5]

- 6.a) Find the number of integers between 1 and 250 which are divisible by any of the integers 2,3,5 or 7 and hence find the number of integers between 1, 250 which are not divisible by 2, 3, 5 or 7.

b) State and prove binomial theorem. [5+5]

**OR**

- 7.a) The letters of the word VICTORY are rearranged in all possible ways and the words thus obtained are arranged as in a dictionary, what is the rank of the given word?

b) Use multinomial theorem to expand  $(x_1+x_2+x_3+x_4)^4$ . [5+5]

- 8.a) Solve the recurrence relation  $a_n - 5a_{n-1} + 6a_{n-2} = (n+1)^2$ ,  $a_0=0$ ,  $a_1=1$ .

b) Solve the recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 4^n$ ,  $a_0=0$ ,  $a_1=1$ . [5+5]

**OR**

- 9.a) Explain Fibonacci relation with suitable examples and also solve it.

b) Solve  $a_n - 7a_{n-1} + 10a_{n-2} = 0$ ,  $a_0=10$ ,  $a_1=41$  using generating functions. [5+5]

- 10.a) In any planar graph, show that  $|V| - |E| + |R| = 2$ .

b) Prove that complete graph of 5 vertices is non planar. [5+5]

**OR**

- 11.a) Write an algorithm for breadth first search spanning tree.

b) Write Kruskal's Algorithm and explain it with an example. [5+5]

---oo0oo---