Code No: 133BC

**R16**

**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 flee then you miss the final examination" into symbolic form and also it 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, .) 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]

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