Code No: 113BN **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, February/March - 2016

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) Construct the truth tables of the following formulas.
$(P\leftrightarrow Q)\leftrightarrow((P\wedge Q)\vee(\sim P\wedge\sim Q)$ [2]

b) Write Converse, Opposite, Contrapositive of the statement "If lines AB and CD are parallel, then the alternative interior angles are equal". [3]

c) Let f: R->R and g: R->R, where R is the set of real numbers. Find fog and gof, where $f(x)=x^2-2$ and $g(x)=x+4$. [2]

d) What equivalence relation corresponds to the partitions { {1,3},{2} } [3]

e) Determine the coefficient of $x^5y^{10}z^{10}$ in $(x-7y+3z)^{25}$ [2]

f) A group of 8 scientists is composed of 5-psychologists and 3-sociologists, In how many ways can a committee of 5 be formed that has 3-psychologists and 2-sociologists. [3]

g) Use substitution method to solve $T(n) = T(n-2) + 1$, where $T(1) = 1$. [2]

h) Solve the following recurrence relations using generating functions.
$a_n-6a_{n-1}=0$ for $n>=1$ and $a_0=1$. [3]

i) Define Euler's Path and Euler Circuit. [2]

j) What is circuit rank? G is a connected graph with **n** vertices and **m** edges then find circuit rank of G. [3]

PART- B (50 Marks)

2. Obtain the PDNF and PCNF of the following formulas.
P V (~P-> (Q V (~Q->R))) [10]

OR

3.a) Show that G V H can be derived from the premises $B\wedge C,(B\leftrightarrow C)\rightarrow(H\vee G)$.

b) Derive $P\rightarrow(Q\rightarrow R),Q\rightarrow(R\rightarrow S)\Rightarrow P\rightarrow(Q\rightarrow S)$ (Use CP rule if necessary). [5+5]

4.a) Let G be the set of real numbers not equal to -1 and $*$ be defined by $a*b=a+b+ab$. Prove that $<G,*>$ is an abelian group.

b) Define equivalence relation. Show that $R=\{(x, y)/ x \equiv y \bmod m\}$ is equivalence relation. [5+5]

OR

5.a) Let $f : R \to R$ be defined by

$$f(x) = \begin{cases} x+7 \text{ for } x \le 0 \\ -2x+5 \text{ for } 0 < x < 3 \\ x-1 \text{ for } x \ge 3 \end{cases}$$

Find (i) $f^{-1}(-10)$ (ii) $f^{-1}(8)$ (iii) $f^{-1}(4)$ (iv) $f^{-1}(6)$.

b) Draw the Hasse diagram for the divisibility on the set {1,2,3, 4,8,16,28, 32,64}. [5+5]

6.a) 3 Americans, 3 Mexicans, 3 Canadians are to be seated in a row. How many ways can they be seated so that, no 3 countrymen sit together?

b) How many ways can we distribute 14 indistinguishable balls in 4 numbered boxes so that each box is non empty. [5+5]

OR

7.a) In how many ways can the letters {4.a, 3.b, 2.c} be arranged so that all the letters of the same kind are not in a single block?

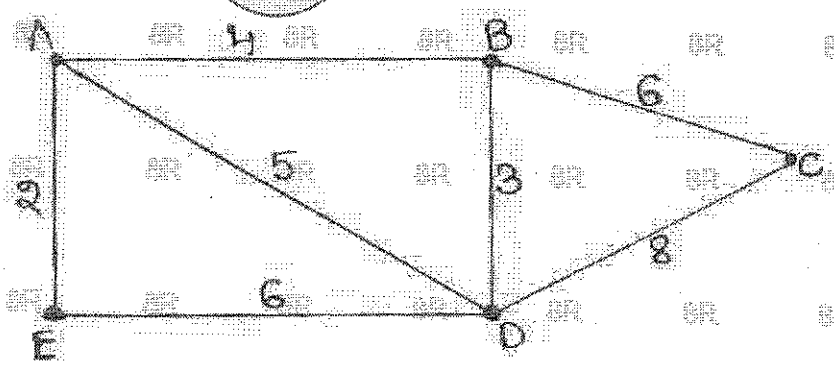
b) Expand the multinomial $(x+y+z)^6$ [5+5]

8. Solve the recurrence relation $a_n + a_{n-1} - 8a_{n-2} - 12a_{n-3} = 0, n \ge 3$ with $a_0 = 1, a_1 = 5, a_2 = 1$. [10]

OR

9. Solve the following recurrence relations for a particular solution.
$a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = n2^n$. [10]

10.a) Apply Kruskal's algorithm to determine a minimal spanning tree for the weighted graph shown below:



b) Show that if a planar graph is self-dual, then $|E| = 2|V| - 2$. [5+5]

OR

11.a) Explain Prim's algorithm with example.

b) Use Euler's formula to show that the graph $K_{3,3}$ is non-planar. [5+5]

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6+2