Code No: 113BN

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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 $x^5 y^{10} z^{10}$ 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 $n \geq 1$ 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.
$P \vee (\sim P \to (Q \vee (\sim Q \to R)))$ [10]

OR

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

 b) Derive P->(Q->R),Q->(R->S)=>P->(Q->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 ≡ y mod m} is equivalence relation.

www.ManaResults.co.in   [5+5]

OR

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

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

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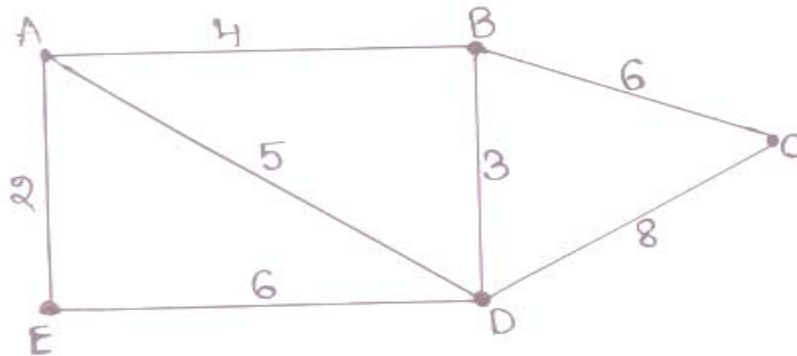
[10]

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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