Code No: 113BN

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June-2015

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to CSE, IT)

Time: 3 Hours **Max. Marks: 75**

1.a) Discuss Free and Bound variables. [2M]

b) Define Conjunctive Normal Form? Find the C.N.F of $A \rightarrow (B \wedge C)$. [3M]

c) Discuss general properties of algebraic system. [2M]

d) Prove that semi group has at most one identity. [3M]

e) Discuss Combinations with repetitions. [2M]

f) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there. [3M]

g) Define non Homogeneous Recurrence relation? Give any two examples. [2M]

h) Use Substitution method to solve **T(n)=T(n-2)+1, T(1)=1.** [3M]

i) Discuss isomorphism of graphs. [2M]

j) Discuss Hamiltonian graph with 6 vertices. [3M]

Part-B **(50 Marks)**

2.a) Write the following arguments in symbolic form. Then establish the validity of the arguments. If I get my Christmas bonus AND my friends are free, I will take a road trip with my friends. If my friends don't find a job after Christmas, then they will be free. I got my Christmas bonus and my friends did NOT find a job after Christmas. Therefore, I will take a road trip with my friends.

b) Show that $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R) \rightarrow R$ is tautology. [5+5]

OR

3.a) Derive the following is valid conclusion by indirect method $\sim Q, P \rightarrow Q \Rightarrow \sim P$.

b) Show that $(\forall x P(x) \vee \forall x Q(x)) \rightarrow \forall x (P(x) \vee Q(x))$ is true.

c) Derive the conclusion from following statements using predicate logic. All dogs bark. Otis does not bark. [3+3+4]

4.a) Discuss the properties of a transitive closure of a binary relation.

b) Find the transitive closure of given matrix [5+5]

$$\begin{bmatrix} 1 & 2 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

OR

5.a) Let G and K be groups, and let $\theta : G \rightarrow K$ be a homomorphism from G to K. Then the kernel ker θ of θ is a normal subgroup of G.

b) Let **x** and **y** be elements of a group G. Then show that $(xy)^{-1} = y^{-1}x^{-1}$. [5+5]

6.a) Discuss multinomial theorem in detail.

b) From **5** consonants and **4** vowels, how many words can be formed using **3** consonants and **2** vowels? [5+5]

OR

7.a) There are **5** novels and **4** biographies. In how many ways can **4** novels and **2** biographies can be arranged on a shelf?

b) A committee of **5** persons is to be formed from **6** men and **4** women. In how many ways can this be done when:

i) At least 2 women are included?

ii) At most 2 women are included? [4+6]

8.a) Solve the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with initial conditions $a_0 = 4$ and $a_1 = 6$.

b) Solve the recurrence relation $a_n = 3a_{n-1} + 2^n$ with initial conditions $a_0 = 2$. [5+5]

OR

9.a) Solve $a_n = -3a_{n-1} + 10a_{n-2} + 3 \cdot 2^n$, $n \geq 2$ with initial conditions $a_0 = 0$ and $a_1 = 6$.

b) Solve recurrence relation using substitution T(n)=2T(n/2)+n. [5+5]

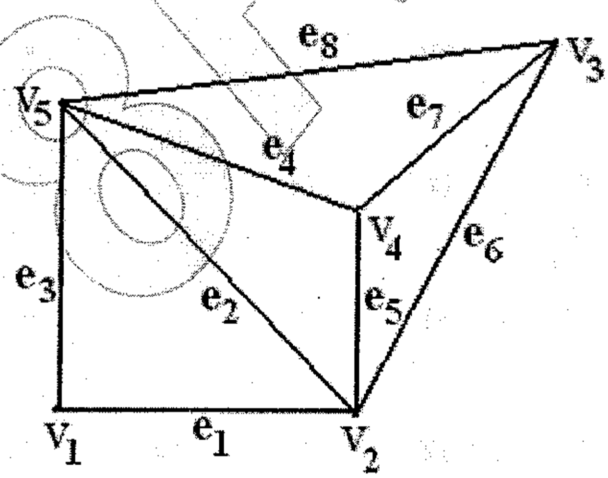
10.a) Show that if a plane graph is self-dual, then $|E| = 2|V| - 2$.

b) Discuss graph coloring problem with required examples. [5+5]

OR

11.a) Give an example for a bipartite graph with examples.

b) Find an Eulerian cycle in the graph. [5+5]



---oOo---