Code No. : 7822 **Sub. Code : C 1 A 1**

M.C.A. (CBCS) DEGREE EXAMINATION,

NOVEMBER 2008

First Semester

COMPUTER APPLICATIONS

MFCS - I

(For those who joined in July 2008 onwards)

Time : Three hours **Maximum : 75 marks**

Part A – (10 x 1 = 10 marks)
Answer ALL questions

1. Write the truth table for conjuctions.
2. Define a conditional statement.
3. Define an inverse of a function.
4. Write any two properties of composite of functions.
5. Give the definition of group homomorphism.
6. Define the left coset of H in G.
7. Define a Poset.
8. State the principle of duality of a Boolean algebra.
9. Define the adjacency matrix of a graph G.
10. Define a rooted tree.

Part B – (5 x 5 = 25 marks)
Answer ALL questions choosing either (a) or (b)

11. (a) Indicate which one of the following is a Tautology or a contradiction.

    (i) $(P \rightarrow (Q \rightarrow P))$

    (ii) $((\neg Q \wedge P) \wedge Q)$.

    (or)

    (b) Obtain disjunctive normal form of

    $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$

12. (a) If f: A $\rightarrow$ B is a bijection map, prove that f^{-1} is also a bijection map

    (or)

(b) Verify that f* (g*h) = (f*g)*h, when f, g, h: $\overline{\mathbb{R}} \rightarrow \overline{\mathbb{R}}$ are defined by f(x) = x2, g $(x) = x + 5$ and h$(x) = \sqrt{x_2 + 2}$

13. (a) Prove that a non-empty set H of a group G is a subgroup iff *ab-1 ∈H, for all a, b, ∈ H*

(or)

(b) Define : *h : (Z, +) → (Z, +) by H (x) = 2x, ∀x ∈Z.* Verify h is homomorphism

14. (a) Let D_{30} = { 1, 2, 3, 5, 6, 10, 15, 30} and let the relation D be divisor on D_{30} (iex$\Re y$ if x divides *y*). Find the Hasse diagram for D_{30}.

(or)

(b) In D_{30} with the relation 'divides' find the complements of each elements in it.

15. (a) Prove that the number of vertices of odd degree in an undirected graph is even.

(or)

(b) Prove that an undirected graph is a tree, iff there is a unique simple path between every pair of vertices.

Part C – (5 x 8 = 40 marks)

Answer All the questions choosing either (a) or (b)

16. (a) Obtain the conjuctive and disjunctive normal forms of the following:

$(\neg P \vee \neg Q) \rightarrow (P \rightarrow \neg Q)$.

Or

(b) Show that SVR is tautologically implied by $(P \vee Q) \wedge (P \rightarrow Q) \wedge (Q \rightarrow S)$.

17. (a) Let f : $\overline{\mathbb{R}} \rightarrow \overline{\mathbb{R}}$ and g: $\overline{\mathbb{R}} \rightarrow \overline{\mathbb{R}}$ where $\overline{\mathbb{R}}$ is the set of real numbers. Find fog and gof, where f$(x) = x_2$-2 and g$(x) = x + 4$. State whether these functions are bijective.

Or

(b) (i) If R is the relation on the set of ordered paris of the integers such that *(a, b), (c,d) ∈R* wherever *ad = bc*, show that R is an equivalence relation.

18. (a) Show that the set Q^+ of all possible rational numbers forms are abelian group under the operation* defined by $a*b = \frac{1}{2}ab$, a, b ∈ Q'.

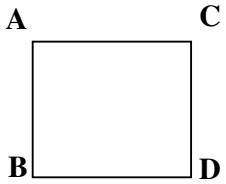
Or

(b) Show that the set of inverses of the elements of a right coset is a left coset i.e., show that $(Ha)^{-1} = a^{-1} H$.

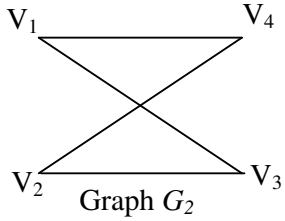
19. (a) Draw the Hasse diagram representing the partial ordering $\{(A,B) / A \subseteq B)\}$ on the power set $P(s)$, where S = {a,bc}. Find the maximal, minimal, greatest and least elements of the poset.

(b) In any Boolean algebra, show that $ab' + a'b = 0$ if and only if $a = b$.

20. (a) consider the two graphs show below:



Graph G_1



Graph G_2

Prove that G1 & G2 are isomorphic, if and only if there exists a permutation matrix P such that $PA_1 P^T - A_2$ where A_1 & A_2 are adjacency matrices of G_1 & G_2 respectively.

(b) Prove that the minimum height of a n-vertex binary tree is equal to $[\log_2 (n+1)\ 1]$, where [x] denotes the smallest integer greater than or equal to x.