(7 pages) **Reg. No. :** ..........................................

**Code No. : 7915** **Sub. Code : HCAM 11**

M.C.A. (CBCS) DEGREE EXAMINATION, NOVEMBER 2015.

First Semester

Computer Applications

MFCS – I

(For those who joined in July 2012 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

1. $(P \to Q) \Leftrightarrow ?$

   (a) $P \vee Q$ (b) $\urcorner P \vee Q$

   (c) $\urcorner P \to Q$ (d) $\urcorner P \to \urcorner Q$

2. A formula which is equivalent to a given formula and which consists of a sum of elementary products is called a ———— form of the given formula.

   (a) Elementary product

   (b) Elementary sum

   (c) Disjunctive Normal

   (d) Conjunctive Normal

3. If a set $S$ has 4 elements then the power set of $S$ has ———— elements.

   (a) 4 (b) 5

   (c) 8 (d) 16

4. A relation R on a set is called ———— relation, if $R = \{(a,b) / a \in A\}$.

   (a) Universal (b) Void

   (c) Identity (d) Equivalence

5. If $(X,\bullet)$ and $(Y,*)$ are two algebraic systems where $\bullet$ and $*$ are binary operations, then the mapping $g : \{X,\bullet\} \to (Y,*)$ is one-to-one onto, then $g$ is called an ————.

   (a) Isomorphism (b) Automorphism

   (c) Epimorphism (d) Homomorphism

6. If G is a finite group of order n, then $a^n = e$ for any element $a \in G$. Say True or False.

7. A complemented, distributive lattice is called

(a) Group (b) Boolean algebra

(c) Monoid (d) Homomorphism

8. In a bounded lattice $\langle L, *, \oplus, 0, 1 \rangle$, an element $b \in L$ is called a complement of an element $a \in L$ if ————.

(a) $a * b = 0$ and $a \oplus b = 1$

(b) $a * b = a$ and $a \oplus b = 1$

(c) $a * b = 1$ and $a \oplus b = 0$

(d) $a * b = b$ and $a \oplus b = 1$

9. Number of path(s) between any two vertices of a graph G is ————.

(a) One (b) Two

(c) Zero (d) More than one



10. Number of edges of a tree with n vertices is ————.

(a) $n$ (b) $n-1$

(c) $n+1$ (d) $\frac{n}{2}$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b), each answer should not exceed 250 words.

11. (a) Construct the truth table for $(p \to q) \to (q \to p)$.

Or

(b) Prove the following implication without using truth table

$(p \vee q) \wedge (p \to r) \wedge (q \to r) \Rightarrow r$.

12. (a) Prove the statement analytically where A, B, C are sets. $(A - B) - C = A - (B \cup C)$.

Or

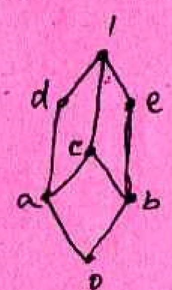
(b) Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{\langle x, y \rangle | x - y$ is divisible by 3$\}$ show that R is equivalence Relation.

13. (a) What are the properties of a group? Explain.

Or

(b) Prove that the necessary and sufficient condition for a non empty subset H of a group $\{G, *\}$ to be a subgroup is $a, b \in H \Rightarrow a * b^{-1} \in H$.

14. (a) Define Lattice and determine whether the poset represented by the Hasse diagram is a lattice or not




Or

(b) In any boolean algebra, show that $(a+b)(a'+c) = ac + a'b = ac + a'b + bc$.

15. (a) Explain the connectedness in directed graphs with example.

Or

(b) What is Binary tree? Write down the properties of Binary tree.



## PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b), each answer should not exceed 600 words.

16. (a) Define Tautology. Determine the following statement is Tautology or not. $((p \to q) \wedge (q - r)) \to (p \to r)$.

Or

(b) Obtain the principal disjunctive normal from of $P \to ((P \to Q) \wedge \neg(\neg Q \vee \neg P))$.

17. (a) (i) Show that the functions $f(x) = x^3$ and $g(x) = x^{\frac{1}{3}}$ for $x \in R$ are inverse of one another.

(ii) If $A = \{1, 2, \ldots\ldots n\}$ show that any function from $A$ to $A$ which is one-to-one must also be onto.

Or

(b) (i) When a relation is said to be anti symmetric? Explain.

(ii) Given $S = \{1, 2, \ldots. 10\}$ and a relation $R$ on $S$ where $R = \{(x, y) | x + y = 10\}$. What are the properties of the relation R?

18. (a) If $\{G, *\}$ is an abelian group, show that $(a * b)^n = a^n * b^n$ for all $a, b \in G$ where $n$ is a positive Integer.

Or

(b) State and prove Lagrange's theorem.

19. (a) (i) What is sublattice? Explain with example.

(ii) State the axioms of Boolean algebra.

Or

(b) (i) Prove that if $\{<, \leq\}$ is a lattice, then for any $a, b \in L$ the following properties holds good :

If $b \leq c$, then $a \vee b \leq a \vee c$.

(ii) Define the following : Lattice homomorphism distributive lattice.

20. (a) What is a graph? How graphs are represented? Explain with example.

Or

(b) Explain the Prim's algorithm for constructing minimum spanning trees.

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