Reg. No. : | | | | | | | | | | |

**Question Paper Code: 35001**

B.E/B.Tech. DEGREE EXAMINATION, NOV 2017

Fifth Semester

Computer Science and Engineering

01UMA521 – DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulation 2013)

Duration: Three hours                                                                 Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define universal and existential quantifiers.

2. Give an indirect proof of the theorem "If $3n + 2$ is odd, then $n$ is odd".

3. How many permutations of $\{a, b, c, d, e, f, g\}$ and with $a$?

4. In how many ways can integers 1 through 9 be permuted such that no odd integer will be in its natural position?

5. Define a complete graph.

6. Give an example of a graph which contains an Eulerian circuit that is also a Hamiltonian circuit.

7. Define a field in an algebraic system.

8. Define a group with an example.

9. Determine whether the poset [ {1, 2, 3, 5), /] is latices or not.

10. What values of the Boolean variables $x$ and $y$ satisfy $xy = x + y$?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Show that *Q.V (P∧7Q)* ∨ *(7P∧7Q)* is a tautology. (8)

(ii) Obtain PDNF of *(P∧Q) V (7P∧R) V (Q∧R)*. Also find PCNF. (8)

Or

(b) Show that RVS follows logically from the premises *CVD, CVD -> 7H, 7H ->A∧7B* and *(A∧7B) -> (RVS).* (16)

12. (a) Use the method of generating function to solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + 4^n$ ; $n \geq 2$ given that $a_0 = 2$ and $a_1 = 8$ . (16)

Or

(b) Prove the principle of inclusion – exclusion using mathematical induction. (16)

13. (a) Prove that a simple graph with $n$ vertices and $k$ components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges. (16)

Or

(b) If all the vertices of an undirected graph are each of degree $k$, show that the number of edges of the graph is a multiple of $k$. (16)

14. (a) State and prove Lagrange's theorem. (16)

Or

(b) (A,$*$) be a monoid such that for every x in A, $x * x = e$ where e is the identity element. Show that (A,$*$) is an abelian group. (16)

15. (a) Show that the De Morgan's laws hold in a Boolean algebra . That is, show that for all $x$ and $y$ ,$\overline{(x \vee y)} = \bar{x} \wedge \bar{y}$ and $\overline{(x \wedge y)} = \bar{x} \vee \bar{y}$. (16)

Or

(b) In a distributive lattice $\{L, \vee, \wedge\}$ if an element $a \in L$ has a complement then it is unique. (16)