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

Question Paper Code: 35021

B.E/B.Tech. DEGREE EXAMINATION, NOV 2018

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. Construct a truth for *(7p <-> 7q) <-> (p <-> q).*

2. Define universal and existential quantifiers.

3. State Pigeonhole principle and its generalization.

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. Define spanning tree.

7. Define a field in an algebraic system.

8. Show that every cyclic group is abelian.

9. When is a lattice said to be bounded?

10. State the Isotonic property of a Lattice.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Show that $(p \to q) \wedge (r \to s), (q \to t) \wedge (s \to u), \neg(t \wedge u) and\ (p \to r) \Longrightarrow \neg p.$ (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) (i) There are 250 students in an engineering college. Out of these 188 have taken a course in Fortran, 100 have taken a course in C and 35 have taken a course in Java. Further 88 have taken a course in both Fortran and C. 23 have taken course in both C and Java, and 29 have taken a course in both Fortran and Java. If 19 of these students have taken all these courses, how many of these 250 students have not taken a course in any of these three programming languages? (8)

(ii) 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 $a_1 = 8$. (8)

Or

(b) (i) Solve the recurrence relation $a_n = 2a_{n-1} + 2^n$, $a_0 = 2$. (8)

(ii) Prove the principle of inclusion – exclusion using mathematical induction. (8)

13. (a) (i) Describe a discrete structure based on a graph that can be used to model airline routes and their flight times. (8)

(ii) Define an Euler path and show that if a graph G has more than two vertices of odd degree, then there can be a no Euler path in G. (8)

Or

(b) (i) If all the vertices of an undirected graph are each of odd degree k, show that the number of edges of the graph is a multiple of K. (8)

(ii) Define a tree and hence prove that a tree with n vertices has $(n - 1)$ edges. (8)

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) (i) In a distributive lattice $\{L, \vee, \wedge\}$ if an element $a \in L$ has a complement then it is unique. (8)

(ii) Find the distinctive normal forms of the Boolean expression $f(x, y, z) = xy + yz'$ by

(1) Truth table method

(2) Algebraic method (8)