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

Question Paper Code: 31051

B.E/B.Tech. DEGREE EXAMINATION, MAY 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. Construct the truth table for the compound proposition $(p \to q) \leftrightarrow (\neg p \to \neg q)$.

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. Find the recurrence relation satisfying the equation $y_n = A(3)^n + B(-4)^n$.

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. Show that every cyclic group is abelian.

9. When is a lattice said to be bounded?

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 $(p \to q) \wedge (r \to s), (q \to t) \wedge (s \to u), \neg(t \wedge u) and\ (p \to r) \Rightarrow \neg p$. (8)

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

Or

(b) (i) Show that RVS follows logically from the premises *CVD*, *CVD* -> *7H*, *7H* ->*A*∧*7B* and (*A*∧*7B*) -> (*RVS*). (8)

(ii) Prove that $\sqrt{2}$ is irrational by giving a proof of contradiction. (8)

12. (a) (i) Solve the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$ with $a_0 = 5, a_1 = -9$ *and* $a_2 = 15$. (8)

(ii) A man hiked for 10 hours and covered a total distance of 45 *km*. It is known that he hilled 6 *km* in the first hour and only 3 *km* in the last hour. Show that he must have hiked at least 9 *km* within a certain period of 2 consecutive hours. (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)

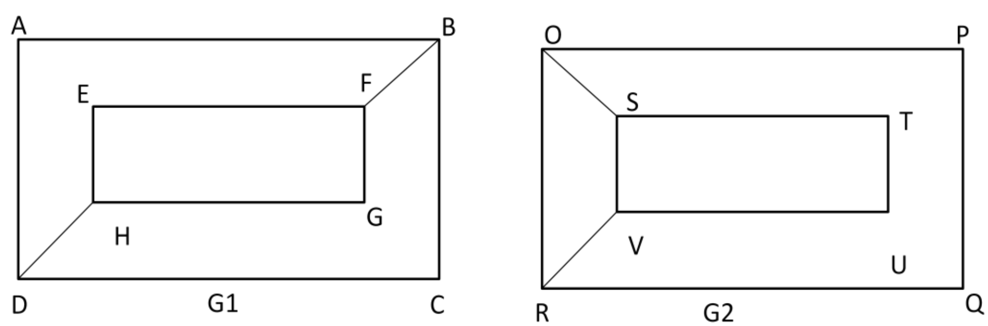
13. (a) (i) Describe a discrete structure based on a graph that can be used to model airline routes and their flight times. (8)

(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 degree k, show that the number of edges of the graph is a multiple of k. (8)

(ii) Determine whether the graphs are isomorphic or not. (8)



14. (a) (i) State and prove Lagrange's theorem. (8)

(ii) Show that the intersection of two normal sub groups of a group *G* is also a normal subgroup of *G*. (8)

Or

(b) (i) $(A,*)$ 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. (8)

(ii) State and prove the fundamental theorem on homomorphism of groups. (8)

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) Prove that the lattice of normal subgroups of a group G (with set inclusion) is a modular lattice. (8)

(ii) Show that a complemented, distributive lattice is a Boolean algebra. (8)
