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

# Question Paper Code: 45021

B.E/B.Tech. DEGREE EXAMINATION, NOV 2019

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. Explain the Kernal of the homomorphism g.
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 $(p \to q) \wedge (r \to s), (q \to t) \wedge (s \to u), \neg(t \wedge u) and\ (p \to r) \Longrightarrow \neg p$. (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)

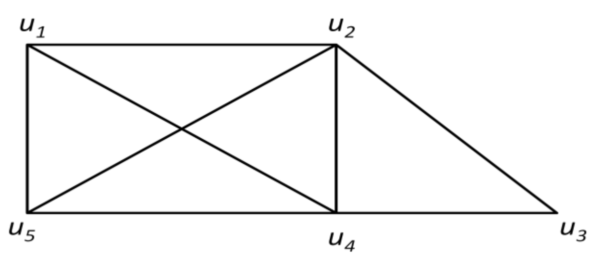
12. (a) Use the method of generating function to solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + 4^n$ ; $n \geq 2$ given that $a_0 = 2$ and $a_1 = 8$. (16)

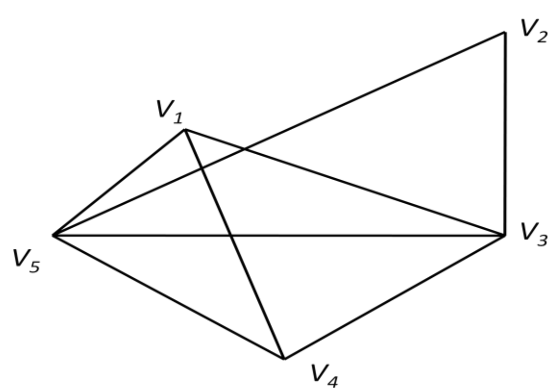
Or

(b) (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) Determine whether the following pairs of graphs are isomorphic. (8)




(ii) Prove that the maximum number of edges in a simple disconnected graph G with $n$ vertices and $k$ components is $\frac{(n-k)\ (n-k+1)}{2}$. (8)

Or



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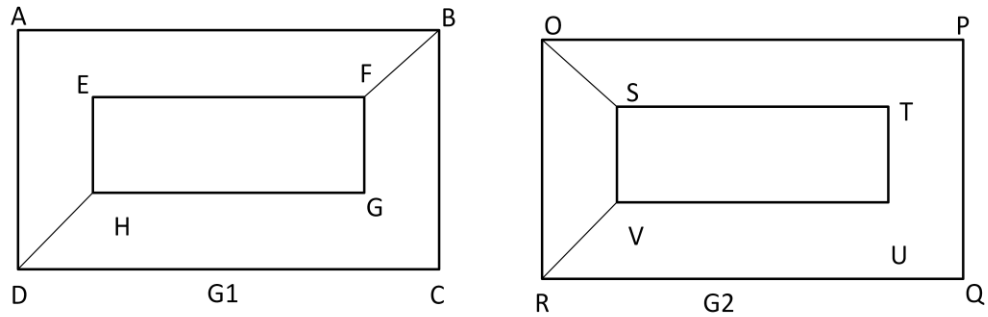
(b) (i) If all the vertices of an undirected graph are each of odd degree *k*, show that the number of edges of the graph is a multiple of *K*. (8)

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




14. (a) (i) Prove that the intersection of two subgroups of a group G is also a subgroup of G. (8)

(ii) State and prove Lagrange's theorem. (8)

Or

(b) (i) Prove that every subgroup of a cyclic group is cyclic. (8)

(ii) If * is the binary operation on the set of real numbers defined by $a*b = a+b+2ab$, show that $(R,*)$ is a commutative monoid. (8)

15. (a) (i) Show that the complement of every element in a Boolean algebra is unique. (8)

(ii) Consider the set of all divisors of 24, check does this form a POSET. Also draw the Hasse diagram of $(D_{24}, /)$. (8)

Or

(b) (i) Let $(L,*,\oplus)$ be a distributive lattice. For any $a, b, c \varepsilon L$. prove that $(a*b = a*c) \wedge (a \oplus b = a \oplus c) \Rightarrow b = c$. (8)

(ii) In any Boolean algebra, show that $a = b$ if $a\bar{b} + \bar{a}b = 0$. (8)