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Question Paper Code: U3028

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Third Semester

Computer Science and Design

21UMA328- DISCRETE MATHEMATICS

(Common to Artificial Intelligence & Data Science Engineering)

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

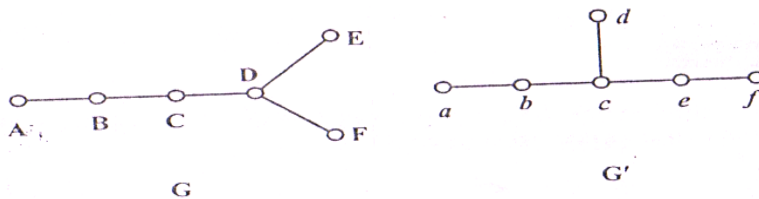
1. Construct the truth table for $\neg(P \rightarrow Q)$ CO1-App
2. Use indirect method, prove that $\neg p \wedge \neg q \Rightarrow \neg(p \wedge q)$ CO1-App
3. In how many ways can letters of the word "THUNAIEZHUTHU" be arranged CO2-App
4. Compute the particular solution of $a_n + 6a_{n-1} + 5a_{n-2} = 2$ CO2-App
5. Define the order of a group CO6- U
6. Compute order of all elements of the group (Z_5, \oplus_5) CO6- U
7. Define Eulerian path and Eulerian circuit CO6-U
8. Define a cycle CO6-U
9. Write absorption laws in Boolean algebra CO6- U
10. Define a distributive lattice CO6- U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Calculate PCNF and PDNF for $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$ CO1- App (8)
- (ii) Using the rules of inference derive & using CP Rule. CO1- App (8)
- $P \rightarrow (Q \rightarrow S), \neg R \vee P, Q \Rightarrow R \rightarrow S$

Or

- (b) (i) Prove the following by Indirect Method. CO1- App (8)
 $P \rightarrow Q, Q \rightarrow R, \neg(P \wedge R), P \vee R \Rightarrow R$
- (ii) Find the direct proof of $P \rightarrow R, Q \rightarrow S, P \vee Q \Rightarrow S \vee R$ CO1- App (8)
12. (a) (i) How many bit of strings of length 10 contain (a) exactly four 1's (b)atmost four 1's (c) atleast four 1's (d)an equal number of 0's and 1's? CO2 -App (8)
- (ii) Using generating functions Solve $a_n = 6a_{n-1} + 2^n, a_0 = 5$ CO2 -App (8)
- Or
- (b) (i) Solve $a_n - 6a_{n-1} + 9a_{n-2} = 3^n, a_0 = 1, a_1 = 1$ CO2 -App (8)
- (ii) Calculate the number of positive integers not exceeding 1300 that are divisible by 2,3,5 or by 7 CO2 -App (8)
13. (a) (i) Let G be a finite group of order 'n' and H be any subgroup of G . Then Show that the order of H divides the order of G. (i.e) $O(H) / O(G)$ CO3 -App (10)
- (ii) Prove that $(G,*)$ is abelian if and only if $(a * b)^{-1} = a^{-1} * b^{-1}$ CO3 -App (6)
- Or
- (b) (i) A non empty subset H of a group $(G,*)$ is a subgroup if only if $a * b^{-1} \in H$ for all $a, b \in H$ CO3 -App (8)
- (ii) Prove that intersection of two subgroup is also a subgroup of G CO3 -App (8)
14. (a) (i) Verify that following are isomorphic graph are not. CO4 -App (8)



- (ii) Define Eulerian graph and Hamiltonian graph. CO4 -App (8)
 Give an example of
- (a) Eulerian but not Hamiltonian
 (b) Hamiltonian but not Eulerian
 (c) Both Eulerian and Hamiltonian
 (d) non Eulerian and non Hamiltonian

Or

- (b) (i) Prove that a given connected graph is Eulerian if and only if all the vertices of G are of even degree. CO4 -App (8)
- (ii) If G is a simple graph with n vertices with minimum degree $\delta(G) = \left\lfloor \frac{n}{2} \right\rfloor$ show that G is connected CO4 -App (8)
15. (a) (i) If $(L, \wedge, \vee) (a \vee b) \wedge (b \vee c) \wedge (c \vee a) = (a \wedge b) \vee (b \wedge c) \vee (c \wedge a)$ CO5-App (8)
- (ii) State and prove isotonic property CO5-App (8)
- Or
- (b) (i) State and prove DeMorgons law for Lattices CO5-App (8)
- (ii) Show that in any Boolean algebra, $a=b$ if and only if $ab' + a'b = 0$ CO5-App (8)

