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

Question Paper Code: 54021

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

Fourth Semester

Computer Science and Engineering

15UMA421 - DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What is the value of $\neg(P \wedge Q)$ if both P and Q are T CO1-R

   (a) T (b) F (c) either T or F (d) Both T or F

2. If A = $P \rightarrow (Q \vee R)$ and B = $(P \rightarrow Q) \vee (P \rightarrow R)$ then CO1-R

   (a) $A \vee B = T$ (b) $A \wedge B = T$ (c) $A \Leftrightarrow B$ (d) $A \Rightarrow B$

3. In how many ways can 5 children arrange themselves in a ring? CO2-R

   (a) 5 (b)5! (c)10 (d)20

4. How many 3-digit numbers can be formed using the digits 1, 3, 4, 5, 6, 8 and 9 so that no digit can be repeated? CO2-R

   (a) 9*8*7 (b)9+8+7 (c) 7*6*5 (d) 7+6+5

5. How many edges are there in a graph with 10 vertices each of degree 5? CO3-R

   (a) 50 (b) 100 (c) 25 (d) 10

6. In a tree pendent vertex has degree CO3-R

   (a) 1 (b) 0 (c) 2 (d) No edges

7. The only idempotent element of a -------- is its identity element. CO4-R

   (a) ring (b) filed (c) group (d) set

8. If every element in a group is its own inverse, then the group is CO4-R

   (a) Closure (b) Identity (c) Abelian (d) Inverse

9. that every distributive lattice is modular and CO5-R

   (a) not conversely (b) conversely (c) not inverse (d) inverse

10. In any Boolean algebra, if a = b iff a $\bar{b}$+ $\bar{a}$b =0 CO5-R

(a) a $\bar{b}$+ $\bar{a}$b =1 (b) a $\bar{b}$+ $\bar{a}$b = a (c) a $\bar{b}$+ $\bar{a}$b =0 (d) a $\bar{b}$+ $\bar{a}$b = b

PART – B (5 x 2= 10Marks)

11. What is tautology? Give an example. CO1-R

12. Write the generating function for the sequence of positive integer CO2-R

13. Define graph isomorphism. CO3-R

14. Define ring and give an example of an ring with zero divisors CO4-R

15. Prove a.(a+b)=a+(a.b) in a Boolean algebra. CO5-R

PART – C (5 x 16= 80Marks)

16. (a) Obtain the PDNF &PCNF of the formula $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$. CO1-App (16)

(i) Using truth table.

(ii) Without using truth table

Or

(b) (i) Using CP or otherwise Obtain the following implication. CO1- App (8)

$(x)(P(x) \rightarrow Q(x)), (x)(R(x) \rightarrow \neg Q(x)) \Rightarrow (x)(R(x) \rightarrow \neg P(x))$

(ii) Prove that $(\exists x)(A(x) \vee B(x)) \Leftrightarrow (\exists x)A(x) \vee (\exists x)B(x)$. CO1- App (8)

17. (a) State and Prove the pigeon hole principle CO2-App (16)

Or

(b) (i) Solve the recurrence relation of the Fibonacci sequence of the numbers $f_n = f_{n-1} + f_{n-2}$, n>2 with the initial conditions $f_1=1$, $f_2=1$. CO2 -Ana (8)

(ii) Show that $3^{2n} + 4^{n+1}$ is a divisible by 5 , $n \geq 0$ by using method of induction CO2 -Ana (8)

18. (a) Prove that the given connected graph G is Eulerian if & only if all the vertices of G are of even degree. CO3-Ana (16)

Or

(b) Define isomorphism between two graphs. Are the simple graphs with the following adjacency matrices isomorphic? CO3-Ana (16)

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 & 0 \end{bmatrix}$$

19. (a) Let (G,*) be finite cyclic group generated by an element $a \epsilon G$ If G is order n,Prove that a_n =e & G ={a,a^2,a^3,…..a^n=e}Where n is least positive integer for which a_n =e CO4-U (16)

Or

(b) Prove that the Kernal of a homomorphism of from group (G,*) to another group (H,Δ) is a normal sub group of (G,*) CO4-Ana (16)

20. (a) If $(L,*,\oplus)$ is distributive lattice and if $a*b=b*c$ and $a \oplus b = a \oplus c$ for all a,b,c ∈ L show that b=c and hence show that complement of an element is unique if it exists in L. CO5-U (16)

Or

(b) Draw the Hasse diagram of the Lattice L of all subsets of {a,b,c} under intersection and union. CO5- U (16)

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