27 MAR 2023

Reg. No.											

Question Paper Code	11751

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022 (MARCH 2023)

First Semester

Computer Science and Business Systems

20BSMA102 – DISCRETE MATHEMATICS

(Regulations 2020)

Duration: 3 Hours — Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Express using logical connectives, "you access the internet from campus only if you are a computer science major or you are not a freshman".	2,K3,CO1
2.	Show that $\neg(p \wedge q) \Rightarrow (\neg p \vee \neg q)$.	2,K2,CO1
3.	How many 16-bit strings are there containing exactly 5 zeros?	2,K2,CO2
4.	Find the recurrence relation for $y_n = A \cdot 2^n + B \cdot 3^n$.	2,K3,CO2
5.	What is the Boolean expression for NAND gate?	2,K1,CO3
6.	Show that in a Boolean Algebra, $a \leq b \Rightarrow a + (b \cdot c) = b \cdot (a + c)$.	2,K2,CO3
7.	Draw a graph with 5 vertices A,B,C,D, E such that deg(A) = 3, B is an odd vertex, deg(C) = 2, D and E are adjacent.	2,K2,CO4
8.	Define chromatic number of a graph G with example.	2,K1,CO4
9.	Define a group with proper example.	2,K1,CO5
10.	Define a Ring with Example.	2,K1,CO5

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11.	a)	(i) Construct the truth table for the following $\neg(P \vee (Q \wedge R)) \leftrightarrow ((P \vee Q) \wedge (P \vee R))$.	8,K2,CO1
		(ii) Show that $((p \vee q) \wedge (\neg p \vee r)) \rightarrow (q \vee r)$ is a tautology.	8,K3,CO1
		OR	
	b)	(i) Find the CNF & DNF of $P \rightarrow ((P \rightarrow Q) \wedge (\neg(\neg Q \vee \neg P)))$ using laws of logic.	8,K3,CO1
		(ii) Find the PCNF & PDNF of $P \rightarrow (Q \wedge P) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$ using laws of logic.	8,K3,CO1
12.	a)	Find the recurrence formula for the Fibonacci sequence of numbers and obtain its solution.	16,K3,CO2

OR

b) State the Pigeon hole principle and also prove that there exists a positive integer n such that m divides $2^n - 1$ where m being a positive odd integer. *16,K3,CO2*

13. a) (i) Prove that in a Boolean Algebra, *8,K3,CO3*

$$(a + b') \cdot (b + c') \cdot (c + a') = (a' + b) \cdot (b' + c) \cdot (c' + a).$$

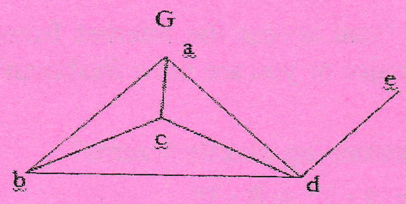
(ii) Prove that in a Boolean Algebra, $a + a'bc' + (b + c)' = a + c'$. *8,K3,CO3*

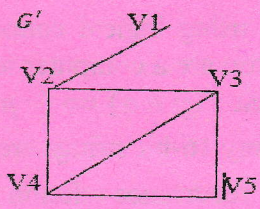
OR

b) Minimize the following Boolean function using K-Map. *16,K3,CO3*

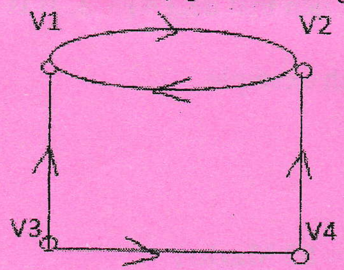
$F = A'B'C' + A'B'C + AB'C + ABC'$.

14. a) (i) Check whether the following graphs are isomorphic or not. *8,K3,CO4*





(ii) Consider the following digraph. Use its adjancy matrix to find how many paths of length 3 from V1 to V2. *8,K3,CO4*



OR

b) (i) Prove that the maximum number of edges in a simple disconnected graph G with n vertices and k components is $\dfrac{(n-k)(n-k+1)}{2}$. *8,K3,CO4*

(ii) Prove that a graph is a tree if and only if there is a unique simple path between every pair of vertices. *8,K3,CO4*

15. a) State and Prove Fundamental theorem of Group homomorphism. *16,K3,CO5*

OR

b) State and Prove Lagrange's Theorem. *16,K3,CO5*