Reg. No.								

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

PG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: M.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
I	PART - III	CORE ELECTIVE-2	P23MA1E2B	DISCRETE MATHEMATICS

Date : 14.11.2024 / AN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	**SECTION – A (10 X 1 = 10 Marks)** **Answer ALL Questions.**
CO1	K1	1.	If P is false, Q is True, then P ∧ Q is _____. a) true b) false c) 0 d) 1
CO1	K2	2.	The formula P → Q. The statement Q is called _____. a) consequent b) successor c) antecedent d) predecessor
CO2	K1	3.	How many different bit strings of length seven are there. a) 120 b)124 c) 126 d) 128
CO2	K2	4.	What is the least number of area codes needed to guarantee that the 25 million phones in a state can be assigned distinct 10-digit telephone numbers. a) 2 b) 3 c) 4 d) 5
CO3	K1	5.	A relation R on a set A is called ____ if (a, a) ∈ R for every element a ∈ A. a) symmetric b) anti symmetric c) reflexive d) transitive
CO3	K2	6.	A relation on a set A is called an _____ if it is reflexive, symmetric, and transitive. a) congruence b) equivalence relation c) anti symmetric d) symmetry
CO4	K1	7.	Translate the logical equivalence $(\mathbf{T} \wedge \mathbf{T}) \vee \neg \mathbf{F} \equiv \mathbf{T}$ into an identity in Boolean algebra. a) 0 b) 1 c) 2 d)3
CO4	K2	8.	How many different Boolean functions of degree n are there? a) 2n b)2^n c) 2^{2n} d)2^{2^n}
CO5	K1	9.	The basic element of circuits are called _____. a) boolean sum b) boolean algebra c) gates d) circuits
CO5	K2	10.	The ------- which accepts the value of one Boolean variable as input and produces the complement of this value as its output. a) logic b) inverter c) AND d) OR
Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K2	11a.	Construct the truth table for $\neg(\neg P \wedge \neg Q)$ **(OR)**
CO1	K2	11b.	Show that P → Q and $\neg P \vee Q$ are logically equivalent.
CO2	K2	12a.	Show that for every integer n there is a multiple of n that has only 0s and 1s in its decimal expansion. **(OR)**
CO2	K2	12b.	In how many ways can we select three students from a group of five students to stand in line for a picture? In how many ways can we arrange all five of these students in a line for a picture?

CO3	K3	13a.	Write any two properties of relations with examples. **(OR)**
CO3	K3	13b.	Let $A = \{a1, a2, a3\}$ and $B = \{b1, b2, b3, b4, b5\}$. Which ordered pairs are in the relation R represented by the matrix $\mathbf{M}R = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \end{pmatrix}$
CO4	K3	14a.	Find the values of the Boolean function represented by $F(x, y, z) = xy + \bar{z}$. **(OR)**
CO4	K3	14b.	Find the sum-of-products expansion for the function $F(x, y, z) = (x + y)\bar{z}$
CO5	K4	15a.	A committee of three individuals decides issues for an organization. Each individual votes either yes or no for each proposal that arises. A proposal is passed if it receives at least two yes votes.Design a circuit that determines whether a proposal passes. **(OR)**
CO5	K4	15b.	Construct circuits that produce the following outputs: (a) $(x + y)\,x$, (b) $x\,(y + z)$,

Course Outcome	Bloom's K-level	Q. No	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K4	16a.	Write the following sentences in the closed form (Assume that the universe consists of literally everything) a) Some people who trust others are rewarded. b) If anyone is good then John is good. c) He is ambitious or no one is ambitious d) Some one is teasing **(OR)**
CO1	K4	16b.	Show that $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology.
CO2	K5	17a.	Prove that If n and r are integers with $0 \le r \le n$, then $P(n, r) = \frac{n!}{(n-r)!}$ **(OR)**
CO2	K5	17b.	How many poker hands of five cards can be dealt from a standard deck of 52 cards? Also, how many ways are there to select 47 cards from a standard deck of 52 cards? (ii) A group of 30 people have been trained as astronauts to go on the first mission to Mars. How many ways are there to select a crew of six people to go on this mission (assuming that all crew members have the same job)?
CO3	K5	18a.	Define Closure. What is the symmetric closure of the relation $R = \{(a, b) \mid a > b\}$ on the set of positive integers? Explain. **(OR)**
CO3	K5	18b.	Prove that the transitive closure of a relation R equals the connectivity relation R^*.
CO4	K5	19a.	Define dual. Find the duals of $x(y + 0)$ and $\bar{x}\,1 + (\bar{y} + z)$. **(OR)**
CO4	K5	19b.	Show that De Morgan's laws hold in a Boolean algebra
CO5	K6	20a.	Sometimes light fixtures are controlled by more than one switch. Circuits need to be designed so that flipping any one of the switches for the fixture turns the light on when it is off and turns the light off when it is on. Design circuits that accomplish this when there are two switches and when there are three switches. **(OR)**
CO5	K6	20b.	Use K-maps to minimize these sum-of-products expansions. (a) $xyz + xy\,z + xyz + x\,y\,z$ (b) $xyz + xy\,z + xyz + x\,yz + x\,y\,z$ (c) $xyz + xyz + xyz + xy\,z + xyz + x\,yz + x\,y\,z$ (d) $xyz + xy\,z + x\,yz + x\,y\,z$