Reg. No. | | | | | | | | |

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

UG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2025.
(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: B.C.A.

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	ELECTIVE GENERIC - 3	U23CA3A3	DISCRETE MATHEMATICS

Date & Session: 12.11.2025/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.	A relation R on a set A is called a partial order if it is _____. a) reflexive, symmetric, and transitive b) Reflexive, antisymmetric and transitive c) Antisymmetric and symmetric d) Irreflexive and transitive
CO1	K2	2.	Let $a, b, c \in A$. Then a relation R on a set A is called antisymmetric if __. a) $(a,b),(b,c) \in R \Rightarrow (a,c) \in R$ b) $(a,b) \in R \Rightarrow (b,a) \in R$ c) $(a,b),(b,a) \in R \Rightarrow a = b$ d) $(a,a) \in R$
CO2	K1	3.	How many functions are there from a set with m elements to a set with n elements is_____. a) nm b) n^m c) m^n d) m+n
CO2	K2	4.	The conjunction $p \wedge q$ is true when _____. a) $p$and $q$are true b) p or $q$is true c) only p is true d) only q is true
CO3	K1	5.	$\neg(p \wedge q) \equiv \neg p \vee \neg q$ is called the _____law. a) identity b) domination c) idempotent d) De Morgan's
CO3	K2	6.	The truth value of the negation of the proposition "3+6=9" is _____. a) True b) False c) either true or false d) not a proposition
CO4	K1	7.	An edge of the form (a,a) is called _____. a) loop b) multi-edge c) isolated d) pendent
CO4	K2	8.	If A is a nonsingular square matrix, then A^{-1}= _____. a) Det = 0 b) $1/(\|A\|)$ adj A c) adj (A) d) $\|A\|$
CO5	K1	9.	The initial vertex and terminal vertex of a loop are the _____. a) equal b) same c) not same d) not equal
CO5	K2	10.	An undirected graph has an even number of vertices of odd _____. a) degree b) edges c) order d) connected

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Let f:R→R be defined by $f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ 2x - 1 & \text{if } x \geq 1 \end{cases}$ Define a function g(x)=f(f(x)) (i) Find g(0) g(1) and g(2). (ii) Is g continuous at x=1? Justify. **(OR)**
CO1	K3	11b.	Let f:R→R defined by $f(x) = \frac{x-1}{x+2}$, x≠ -2 (i) Find $f^{-1}(x)$, the inverse of f. (ii) Verify that $f(f^{-1}(x))=x$
CO2	K3	12a.	How many one to one functions are there from a set with m elements to set with n elements? **(OR)**
CO2	K3	12b.	Let $f(x)=x^2+2x+1$ and g(x)= $\sqrt{x}$, where x≥0 (i) (f+g)(x) (ii) (f·g)(x) (iii) (f∘g)(x)
CO3	K4	13a.	Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent. **(OR)**
CO3	K4	13b.	Show that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$is a tautology.
CO4	K4	14a.	Find the rank of A = $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 4 & 2 \end{bmatrix}$ **(OR)**
CO4	K4	14b.	Find the adjoint of the matrix A = $\begin{bmatrix} 2 & 4 & -1 \\ 0 & 3 & 7 \\ 8 & 1 & 5 \end{bmatrix}$
CO5	K5	15a.	Explain the different types of graphs with suitable examples. **(OR)**
CO5	K5	15b.	Define graph and explain how graphs are represented in memory.

Course Outcome	Bloom's K-level	Q. No.	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Let A={1,2,3}, and define relations on A as follows: R1={(1,1),(2,2),(3,3),(1,2),(2,1)} R2={(1,2),(2,3),(1,3)} (a) Classify the relation R1 on the basis of the following properties and justify: Reflexivity Symmetry

			Transitivity (b) Compute the composition R2∘R2. Is R2transitive? Justify your answer using your composition result **(OR)**
CO1	K3	16b.	Consider the relation on the set of integers: (i) $R_1 = \{(a,b) \mid a \leq b\}$. (ii) $R_2 = \{(a,b) \mid a > b\}$ (iii) $R_3 = \{(a,b) \mid a = bora = -b\}$ (iv) $R_4 = \{(a,b) \mid a = b\}$ (v) $R_5 = \{(a,b) \mid a = b+1\}$ (vi) $R_6 = \{(a,b) \mid a+b \leq 3\}$ Which of the relations are reflexive, symmetric, anti-symmetric.
CO2	K4	17a.	Prove that the function f(x)= $\frac{5x-7}{2}$ is bijective. (i) Find the inverse of f. (ii) Verify that $f(f^{-1}(x))=x$ **(OR)**
CO2	K4	17b.	Let f(x)=$\frac{1}{x}$, g(x)=x+2 (i) Find (f∘g)(x) and (g∘f)(x) (ii) Are f∘g and g∘f equal? Justify your answer. (iii) State the domain of f∘g and g∘f
CO3	K4	18a.	Prove the following by developing a series of logically equivalences (i)$\urcorner (p \rightarrow q) \equiv p \wedge \urcorner q$ (ii)$\urcorner (p \vee (\urcorner p \wedge q)) \equiv \urcorner p \wedge \urcorner q$ (iii) $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (p \wedge r)$ **(OR)**
CO3	K4	18b.	Use truth tables to verify the associative laws and identity law.
CO4	K5	19a.	Define a matrix and explain the different types of matrices with suitable examples. Also discuss scalar multiplication and subtraction of matrices with appropriate rules and examples. **(OR)**
CO4	K5	19b.	Suppose that the relation R_1 and R_2 on a set A are represented by the matrices $M_{R_1} = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ and $M_{R_2} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$. What are the matrices representation of $(i)R_1 \cup R_1(ii)R_1 \cap R_2(iii)SoR(iv)R_1^2(v)R_2^2$.
CO5	K5	20a.	What is a Subgraph? Explain with Examples and Diagrams. **(OR)**
CO5	K5	20b.	Discuss the following graph operations with examples and diagrams: • a) Union of two graphs • b) Intersection of two graphs • c) Complement of a graph