22DAU208N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Second Semester)

Branch - **COMPUTER SCIENCE WITH DATA ANALYTICS**

DISCRETE STRUCTURES AND GRAPH THEORY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Question No.	Question	K Level	CO
1	Two sets A and B are _____ if they contain the same collection of elements. (a) Unequal (b) equal (c) proper (d) None	K1	CO1
2	If U={1,2,3,…,10} and A={1,3,5,7}, then the complement of A is ____. (a) {2,4,6,8} (b) {2,4,6,8,9,10} (c) { } (d) None	K2	CO1
3	A relation R in a set A is reflexive, symmetric and transitive, then R is called ____relation. (a) binary (b) equivalence (c) composite (d) None	K1	CO2
4	A binary relation R is said to be a __relation, if (a,b) in R implies that (b,a) is also in R. (a) symmetric (b) anti symmetric (c) both (d) None	K2	CO2
5	A logical expression which is always true is called a _____. (a) Bi-conditional (b) Tautology (c) contradiction (d) None	K1	CO3
6	The dual of (PvQ)∧R is _____. (a) R∧(QvP) (b) (PvQ)vR (c) (P∧Q)vR (d) (PvQ) ∧R	K2	CO3
7	A graph without any self loops and parallel edges is known as _____ graph. (a) simple (b) general (c) Pseudo (d) None	K1	CO4
8	A vertex in which no edge is incident on it is called _____ vertex. (a) single (b) isolated (c) self (d) None	K2	CO4
9	A connected acyclic graph is called a _____. (a) path (b) loop (c) tree (d) None	K1	CO5
10	The _____of a vertex 'v' is the number of edges incident on the vertex 'v'. (a) order (b) degree (c) root (d) None	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Identify that for any two sets A and B, $A-(A\cap B)=A-B$.	K3	CO1
	(OR)		
11.b.	Apply Permutation and combination. Identify in how many ways can you arrange the letters in the words COMPUTER, ENGINE?		
12.a.	Explain the properties of binary relations with example.	K2	CO2
	(OR)		
12.b.	Consider the following relation on {1,2,3,4,5,6} $R=\{(i,j)/\lvert i-j\rvert=2\}$. Examine whether R is an equivalence relation.		
13.a.	Construct the truth table for bi-conditional operator.	K3	CO3
	(OR)		
13.b.	Solve using truth table $(P\rightarrow Q)\Leftrightarrow(\neg P\vee Q)$.		
14.a.	Examine that in a graph with n vertices, if there is a path from vertex v_1 to vertex v_2, then there is a path of no more than n-1 edges from vertex v_1 to vertex v_2.	K4	CO4
	(OR)		
14.b.	Examine that there is always a Hamiltonian path in a directed complete graph.		
15.a.	Analyze that a circuit and the complement of any spanning tree must have atleast one edge in common.	K4	CO5
	(OR)		
15.b.	Analyze that a graph with e=v-1 that has no circuit is a tree.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Question No.	Question	K Level	CO
16	Examine that $1^2+2^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$, $n\geq 1$ by mathematical induction.	K4	CO1
17	Let $(P,\leq)$ be partially ordered set. Suppose the length of the longest chains in P is n. Then analyze that the elements in P can be partitioned into n disjoint antichains.	K4	CO2
18	Test for $(P\wedge Q)\rightarrow P$ is a Tautology.	K4	CO3
19	Examine that an undirected graph possesses an Eulerian path if and only if it is connected and has either zero or two vertices of odd degree.	K4	CO4
20	Examine that a graph in which there is a unique path between every pair of vertices is a tree.	K4	CO5

Z-Z-Z END