

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION MAY 2024
(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)

Module No.	Question No.	Question	K Level	CO
1	1	If x is a set and the set contains the real number between 1 and 2, then the set is _____. a) Empty set b) Finite set c) Infinite set d) countable set	K1	CO1
	2	In how many ways 2 students can be chosen from the class of 20 students? a)190 b) 200 c)180 d)240	K2	CO2
2	3	Every finite lattice must be a _____. a) sub lattice b) complete lattice c) free lattice d) partial lattice	K1	CO1
	4	The partial ordering relation on $\mathcal{P}(S)$ corresponding to the operations \cap and \cup is the subset relation _____. a) \subseteq b) \leq c) = d) \geq	K2	CO2
3	5	Conjunction of two tautologies is also a _____. a) tautology b) contradiction c) inverse d) converse	K1	CO1
	6	Which of the following is not a factor of $\sim Q \wedge P \wedge \sim P$? a) $\sim Q$ b) $P \wedge \sim P$ c) $\sim Q \wedge P$ d) Q	K2	CO2
4	7	A graph that has neither self-loops nor parallel edges is called a _____. a) simple graph b) linear complex c) parallel edges d) self-loop	K1	CO1
	8	An isomorphic graph must have the same number of _____. a) labels b) edges c) series d) loops	K2	CO2
5	9	A connected acyclic graph is called _____. a) cyclic graph b) tree c) Walk d) Path	K1	CO1
	10	There is a _____ path between every two vertices in a tree. a) unique b) different c) many d) ifinite	K2	CO2

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Show that any positive integer n greater than or equal to 2 is either a prime or a product of primes.	K3	CO1
		(OR)		
	11.b.	How many 4 digits can be formed using figures 0,1,2,3,4 and 5?		
2	12.a.	Explain when the binary relation is said to be a partial ordering relation with an example.	K2	CO2
		(OR)		
	12.b.	Define upper bound, lower bound and lattice with an example.		
3	13.a.	Show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.	K3	CO3
		(OR)		
	13.b.	Show that $R \wedge (P \vee Q)$ is a valid conclusion from premises $P \vee Q, Q \rightarrow R, p \rightarrow M$ and $\neg M$.		
4	14.a.	Define isomorphic and complement of a subgraph with example.	K3	CO4
		(OR)		
	14.b.	In a graph with n vertices, if there is a path from vertex v_1 to vertex v_2 , then show that there is a path of no more than n-1 edges from vertex v_1 to vertex v_2 .		
5	15.a.	Criticize about rooted tree with suitable example.	K4	CO5
		(OR)		
	15.b.	Every circuit has an even number of edges in common with every cut-set. Justify.		

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Show that $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}, n \geq 1$ by mathematical induction.	K4	CO1
2	17	Explain Pigeonhole principal with example.	K4	CO2
3	18	Obtain the principal conjunctive normal form of the formula S given by $(\neg P \rightarrow R) \wedge (Q \Leftrightarrow P)$.	K4	CO3
4	19	Let G be a graph of n vertices. If the sum of the degrees for each pair of vertices in G is n-1 or larger the show that there exists a Hamiltonian path in G.	K4	CO4
5	20	Discuss the properties of trees.	K4	CO5