

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Sixth Semester)

Branch – MATHEMATICS

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	The total number of edges in a complete graph with 5 vertices is _____. (i) 6 (ii) 8 (iii) 10 (iv) 12	K1	CO1
2	If the terminal vertices of an edge are same then the edge is known as _____. (i) parallel (ii) self loop (iii) adjacent (iv) incident	K2	CO1
3	If there is only one path between every pair of vertices, then the graph is called _____. (i) complete (ii) regular (iii) tree (iv) Euler	K1	CO2
4	The total number of edges in a binary tree is twice the number of _____. (i) pendant vertices (ii) branches (iii) non-pendant vertices (iv) isolated vertices	K2	CO2
5	A regular graph with 6 vertices and 9 edges is _____. (i) planar (ii) non - planar (iii) not defined (iv) not exist	K1	CO3
6	The vertices of every planar graph can be properly colored with _____ colors. (i) 3 (ii) 4 (iii) 5 (iv) 6	K2	CO3
7	The number of ones in each row of an incidence matrix of a graph equals _____ of the corresponding vertex. (i) degree (ii) branch (iii) chord (iv) incident	K1	CO4
8	The adjacency matrix does not represent _____. (i) self-loop (ii) parallel edges (iii) path (iv) circuit	K2	CO4
9	No edge in a directed walk appears more than once but a vertex may appear more than once (i) true (ii) false (iii) not necessary (iv) not defined	K1	CO4
10	In a circuit matrix a row which contains single 1 corresponds to _____. (i) parallel edge (ii) self-loop (iii) pendant vertex (iv) isolated vertex	K2	CO4

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Explain isomorphism of graphs with an example.	K2	CO1
	(OR)		
11.b.	If a graph (connected or disconnected) has exactly two vertices of odd degree then prove that there must be a path joining these two vertices.		
12.a.	Prove that if 'P' be the no. of pendant vertices (terminal vertices) in a binary tree 'T' with n vertices then $p = \frac{n+1}{2}$	K2	CO2
	(OR)		
12.b.	Prove that a graph G with 'n' vertices and (n-1) edges and no circuit is connected.		
13.a.	Prove that a graph can be embedded on the surface of the sphere iff it can be embedded in a plane.	K2	CO3
	(OR)		
13.b.	Explain the steps to detect the planarity of a graph.		
14.a.	Explain circuit matrix with an example.	K2	CO4
	(OR)		
14.b.	Explain Path matrix with an example		
15.a.	Explain Adjacency matrix with an example & Write any two observations from the matrix.	K2	CO4
	(OR)		
15.b.	Prove that the $(i,j)^{th}$ entry in X^r equals the number of different edge sequences of length 'r' edges from i^{th} vertex j^{th} vertex.		

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

Question No.	Question	K Level	CO
16	Prove that a connected graph G is an Euler graph iff all vertices of G are of even degree.	K2	CO1
17	Show that any connected graph with n vertices & (n-1) edges is a Tree.	K2	CO2
18	Prove that Kuratowski's Second graph is non-planar.	K2	CO3
19	Define Minimal covering with example. Write a note on the observations of the Minimal covering.	K2	CO4
20	Prove that the determinant of every square submatrix of the incidence matrix A of a digraph G is 1 or -1 or 0	K2	CO4