Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP/S2PT) Examinations May 2026 (2019 Scheme)

Course Code: MAT206
Course Name: GRAPH THEORY

Max. Marks: 100 Duration: 3 Hours

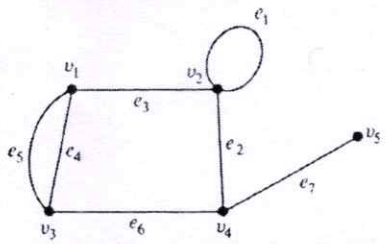
PART A

(Answer all questions; each question carries 3 marks) Marks

1 Define the following: (3)

(i)Isolated vertex (ii) Pendant vertex (iii) Null graph

2 Find the degree of each vertex in the following graph. (3)

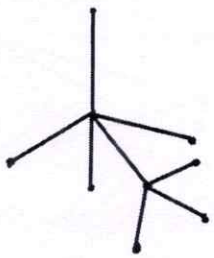


3 What is a Hamiltonian circuit? Give example. (3)

4 Differentiate between symmetric and asymmetric digraphs with examples. (3)

5 Draw all unlabelled trees with 4 vertices. (3)

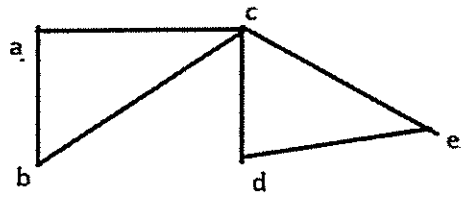
6 Label the vertices of the following graph with their eccentricities. Hence find the diameter and centre of the graph. (3)



7 Define planar graph and non-planar graph with examples. (3)

8 Show that every cut set in a connected graph must contain at least one branch of every spanning tree of G. (3)

9 Define adjacency matrix. Write the adjacency matrix of the graph given below. (3)



10 Show that every tree with two or more vertices is 2-chromatic. (3)

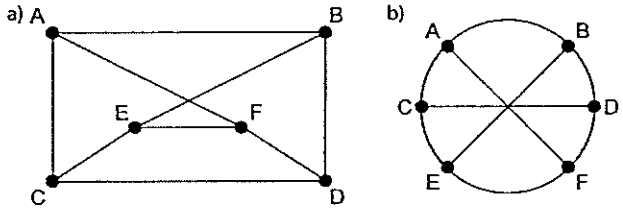
PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11 a) What is a complete graph? Draw the complete graphs of n vertices where the value of n can be 1,2,3,4,5,6. (7)

b) Determine whether the following graphs are isomorphic. Justify. (7)

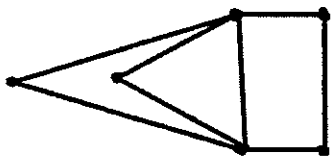


12 a) If a graph has exactly two vertices of odd degree, then prove that there must be a path joining these two vertices. (7)

b) Prove that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. (7)

Module -2

13 a) Define Euler graph. Consider the graph G given below. Is G an Euler? If yes, write an Euler line from G. (7)



b) Explain Travelling salesman problem with suitable example. (7)

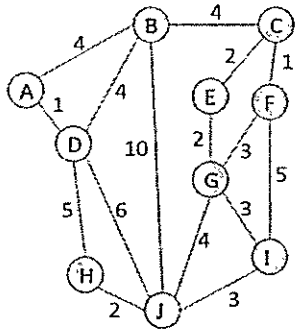
14 a) Prove that a connected graph G is an Euler graph if all vertices of G are of even degree. (8)

b) Distinguish between strongly connected and weakly connected digraphs with examples. (6)

Module -3

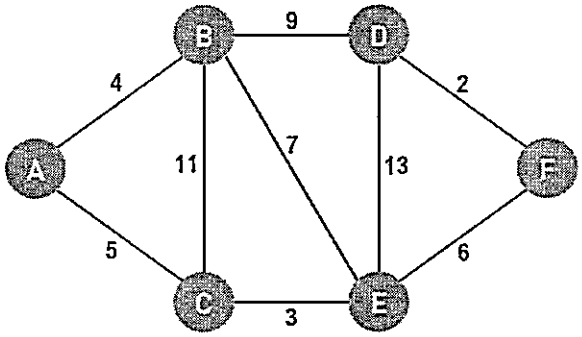
15 a) Prove that every tree has either one or two centres. (7)

b) Use Prim's algorithm to find the minimal spanning tree of the following graph. (7)



16 a) Prove that a graph G is a tree if and only if there is one and only one path between every pair of vertices in G. (7)

b) Find the shortest distance between A and F using Dijkstra's algorithm. (7)

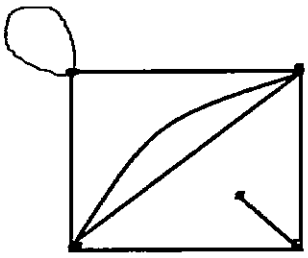


Module -4

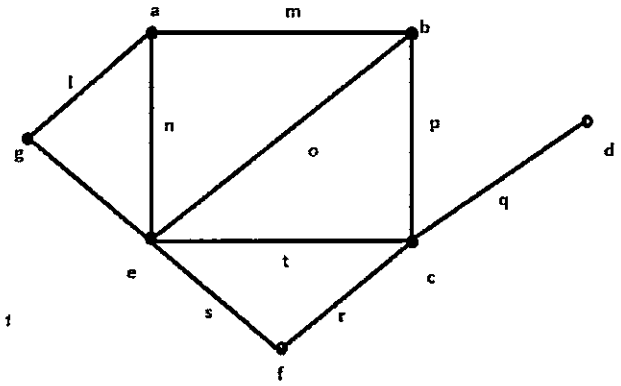
17 a) Prove that the complete graph on five vertices is non-planar. (7)

b) Prove that a connected planar graph G with n vertices and e number of edges has $f=e-n+2$ regions or faces. (7)

18 a) Draw the geometric dual of the graph given below. (7)

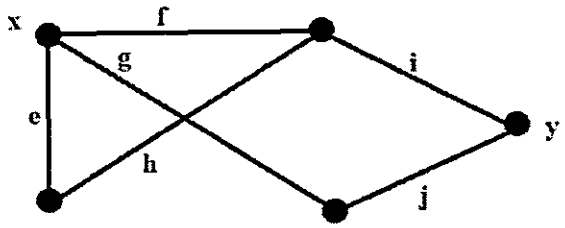


b) Find the spanning tree and all fundamental cut sets, associated the graph given below. (7)



Module -5

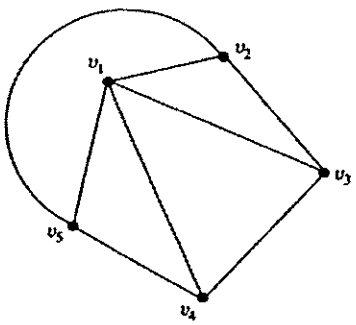
19 a) Define circuit matrix of a graph. Find the circuit matrix for the graph given below. (7)



b) Check whether the graph having the following adjacency matrix is connected or not. (7)

	A	B	C	D	E
A	0	1	1	1	0
B	1	0	0	1	1
C	1	0	0	1	0
D	1	1	1	1	1
E	0	1	0	1	0

20 a) Find the chromatic polynomial of the graph given below. (7)



b) Prove that a covering G of a graph is minimal if and only if G contains no path of length three or more. (7)

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