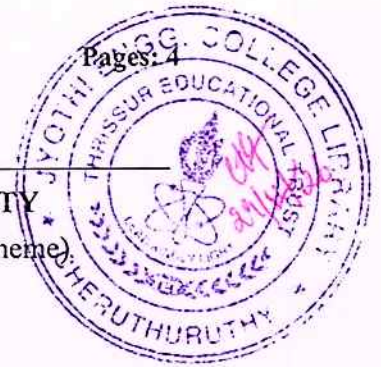


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S4 (R) (FT/WP) Examinations April 2026 (2024 Scheme)



Course Code: GAMAT401

Course Name: MATHEMATICS FOR INFORMATION SCIENCE - IV

Max. Marks: 60

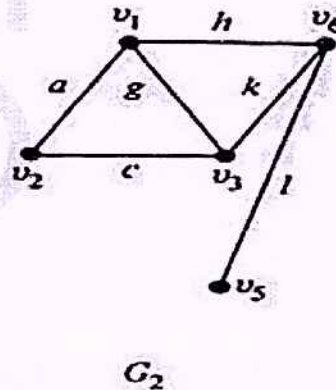
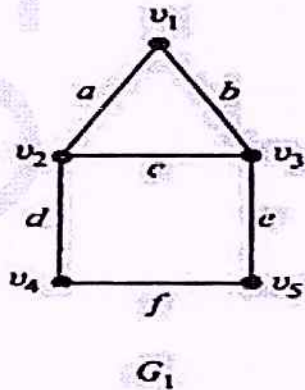
Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

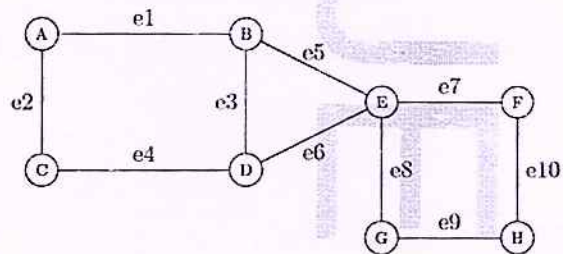
CO Marks

- | | | | |
|---|---|---|-----|
| 1 | A simple, undirected graph G has 17 edges. It contains 2 vertices of degree 5, 2 vertices of degree 4, 4 vertices of degree 3 and all the remaining vertices have degree 2. Find the total number of vertices in the graph. | 1 | (3) |
| 2 | State the Königsberg bridge problem and draw its graph. | 1 | (3) |
| 3 | Define Hamiltonian path and Hamiltonian circuit with examples. | 2 | (3) |
| 4 | Let G_1, G_2 be two undirected, labelled graphs as given below. Find the union of G_1 and G_2 and ring sum of G_1 and G_2 . | 2 | (3) |



- | | | | |
|---|---|---|-----|
| 5 | Prove that there is one and only one path between every pair of vertices in a tree. | 3 | (3) |
| 6 | Define Spanning tree. Give an example. | 3 | (3) |
| 7 | Define Fundamental Circuit with example. | 4 | (3) |

- 8 Find the Edge connectivity and vertex connectivity of the graph given below. 4 (3)



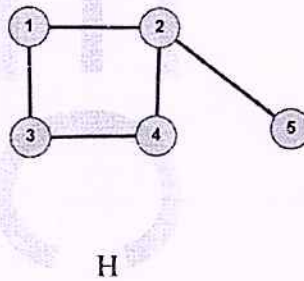
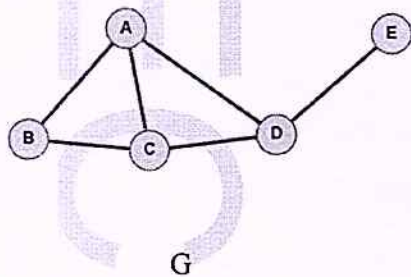
PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

- 9 (a) Determine whether the following graphs are isomorphic. 1 (3)

Justify your answer.



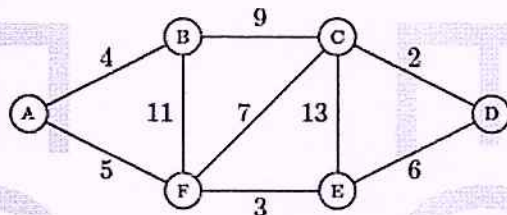
- (b) Prove that a simple graph with n vertices and k components can have almost $\frac{(n-k)(n-k+1)}{2}$ edges. 1 (6)
- 10 (a) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. 1 (4)
- (b) Define walk, path and circuit and give examples. 1 (5)

Module-2

- 11 (a) Prove that a connected graph G is an Euler graph if and only if all the vertices are of even degree. 2 (6)
- (b) What is decomposition of a graph? Illustrate with an example. 2 (3)
- 12 (a) Define Directed graph. Differentiate between symmetric digraph and asymmetric digraph. 2 (3)
- (b) Prove that in a complete graph with n vertices there are $\frac{n-1}{2}$ edge disjoint Hamiltonian circuits, if n is an odd number ≥ 3 . 2 (6)

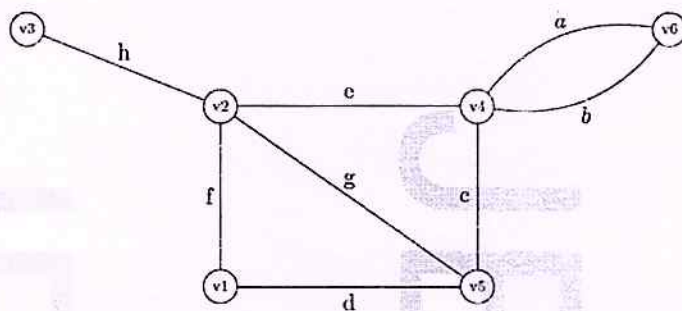
Module-3

- 13 (a) Show that a tree with n vertices has exactly $n-1$ edges. 3 (6)
- (b) Prove that in any tree with two or more vertices, there are at least two pendant vertices. 3 (3)
- 14 Find the shortest distance between A and D using Dijkstra's Algorithm. 3 (9)



Module-4

- 15 a) Prove that every circuit in G has an even number of edges in common with any cut set. 4 (6)
- b) Prove that the vertex connectivity of any graph G can never exceed the edge connectivity of G . 4 (3)
- 16 a) Find Incidence matrix, Adjacency matrix, and Path matrix between v_1 and v_4 for the following graph, 4 (6)



b) If $A(G)$ is the incidence matrix of a connected graph G with n vertices, then prove that $\text{rank}(A(G)) = n - 1$.

4 (3)
