

Name :  
Reg No :



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
07 THRISSUR CLUSTER

Ph.D COURSE WORK EXAMINATION DECEMBER 2021  
Department of Mathematics

07DM 8002 Graph Theory

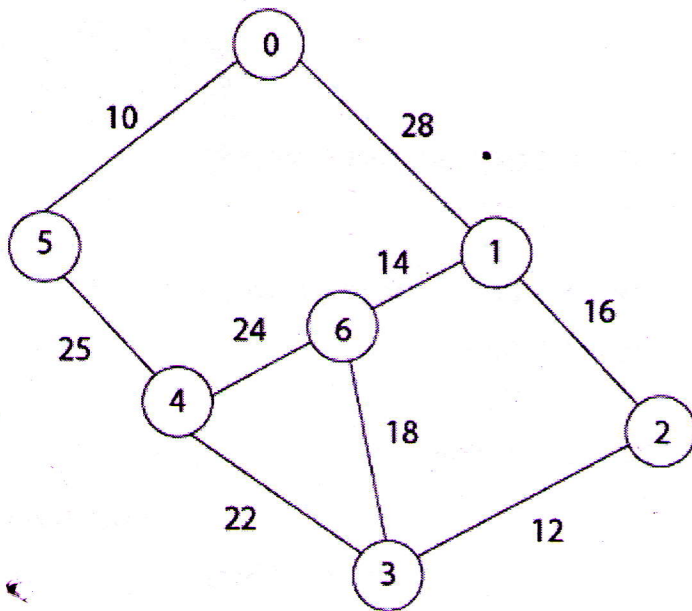
Time:3 hours

Max. Marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.	Module 1	Marks
1a	Define self-complementary graphs. Give two examples.	4
	<b>Answer b or c</b>	
b	Define Eulerian graph. State and prove characterisation of Eulerian graphs.	5
c	Define Hamiltonian graph. State and Prove Dirac's theorem.	5
Q.no.,	Module 2	Marks
2a	Prove that a tree with $n$ vertices has $n-1$ edges.	4
	<b>Answer b or c</b>	
b	Prove that Kuratowski's second graph is non-planar without using Euler's theorem	5
c	State and prove Euler's theorem for planar graphs.	5
Q.no.	Module 3	Marks
3a	Define path matrix and circuit matrix of a graph with suitable examples.	4
	<b>Answer b or c</b>	
b	Write Kruskal's algorithm. Find a minimal spanning tree using Kruskal's algorithm for the following graph.	5



- c Write Dijkstra's algorithm and find a shortest path between all vertices using it for the graph in the previous question. 5

**Q.no. Module 4 Marks**

- 4a Define line graph of a graph. Draw the line graph of  $K_4$ . 4

**Answer b or c**

- b Prove that every tree with two or more vertices is 2-chromatic. 5
- c Define independence number and covering number of a graph with examples. 5

**Q.no. Module 5 Marks**

- 5a Define degree of a vertex, isolated vertex and pendant vertex in a hypergraph. 5

**Answer b or c**

- b Define conformal hypergraph, critical hypergraph and transversal hypergraph. 7
- c Discuss connectedness in hypergraphs. Is every linear hypergraph connected? Justify 7

**Q.no. Module 6 Marks**

- 6a Define domination number and roman domination number of a graph. Is there any relation between them? 5

**Answer b or c**

- b Define magic labelling and anti-magic labelling of a graph. 7
- c Discuss set-labelling and topological set-labelling in graphs. 7