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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF INFORMATION SCIENCE
END TERM EXAMINATION - JUN 2023**

Semester : Semester IV - 2021

Course Code : MAT2028

Course Name : Sem IV - MAT2028 - Graph Theory

Program : BSD

Date : 16-JUN-2023

Time : 1.00PM - 4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(7 X 4 = 28M)

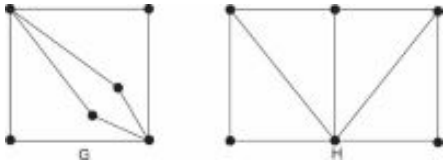
1. Define Hamiltonian graph with an example. (CO2) [Knowledge]
2. Define Bipartite graph with an example. (CO2) [Knowledge]
3. Draw a complete graph on 6 vertices and $K_{3,3}$ graph. (CO2) [Knowledge]
4. Define pendant and isolated vertex of a graph with an example for each. (CO1) [Knowledge]
5. Suppose that tree T has 2 vertices of degree 2, 4 vertices of degree 3 and 3 vertices of degree 4, then what are the number of pendant vertices in T? (CO3) [Knowledge]
6. Define Complete Binary tree with an example. (CO3) [Knowledge]
7. Define induced subgraph with an example. (CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(4 X 11 = 44M)

8. (a) Discuss the Königsberg bridge problem.
 (b) Check if the following graphs G and H are Euler graph as well as Hamiltonian graph.

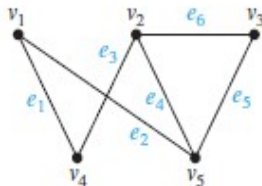


(CO2) [Comprehension]

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

(CO3) [Comprehension]

10. Find the adjacency matrix and incidence matrix for the following graph.



(CO1) [Comprehension]

11. (a) State and prove Handshaking theorem.
 (b) Find the total number of vertices for the graphs G, when G has 10 edges, with 2 vertices of degree 4 and all others are of degree 3.

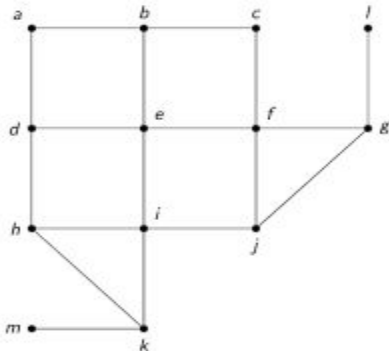
(CO1) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

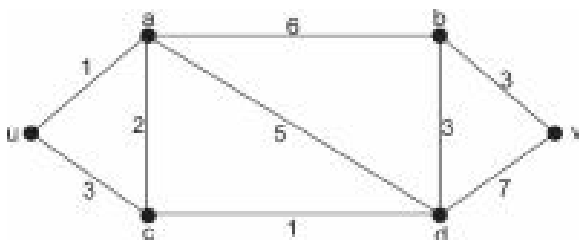
(2 X 14 = 28M)

12. Explain Breadth-First search algorithm, and Use Breadth-First search algorithm to produce a spanning tree for the graph given below starting from vertex e.



(CO3) [Application]

13. (a) Explain the Kruskal's algorithm.
 (b) Apply Dijkstra's algorithm to the following graph to find the shortest path from u to v.



(CO4) [Application]