AR 24 Reg. No | | | | | | | | | | |

ANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

Ph. D. (Second Semester – Regular) Examinations, May – 2025

23SPPEMT2011 – Advanced Graph Theory

(Mathematics)

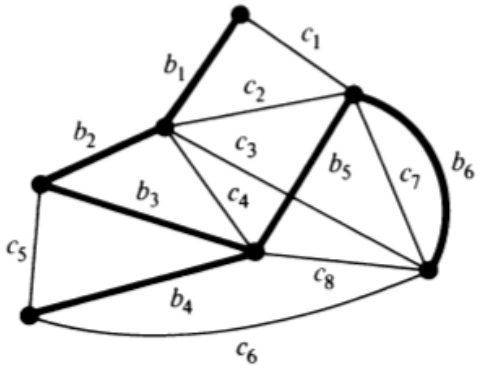
Time: 3 hrs Maximum: 70 Marks

The figures in the right-hand margin indicate marks.

Answer ANY FIVE Questions **(14 x 5 = 70)**

1.a. Prove that a connected graph with n vertices is a tree if and only if it has $n-1$ edges. 6

b. Find two spanning trees for the following graph



8

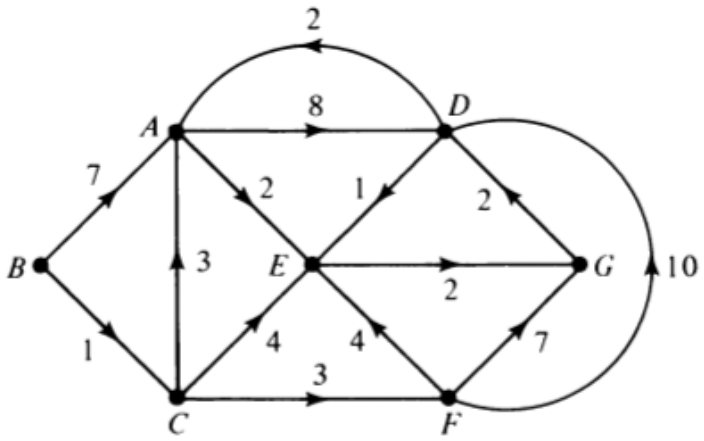
2.a. Prove that the ring sum of two circuits in a graph G has either a circuit or an edge disjoint union of circuits. 7

b. Prove that the vector space of a graph, the circuit subspace and the cut-subspace are orthogonal to each other. 7

3.a. Prove that subspaces W_Γ and W_S are orthogonal complements if and only if $\dim(W_\Gamma \cap W_S) = 0$ 7

b. Find the number of simple graphs with $n(=3,4,5)$ vertices and r edges (for all possible values of r) using Polya's counting theorem. 7

4.a. Explain Dijkstra's algorithm and employ it to find the shortest distance from vertex B to vertex G in the following digraph:



14

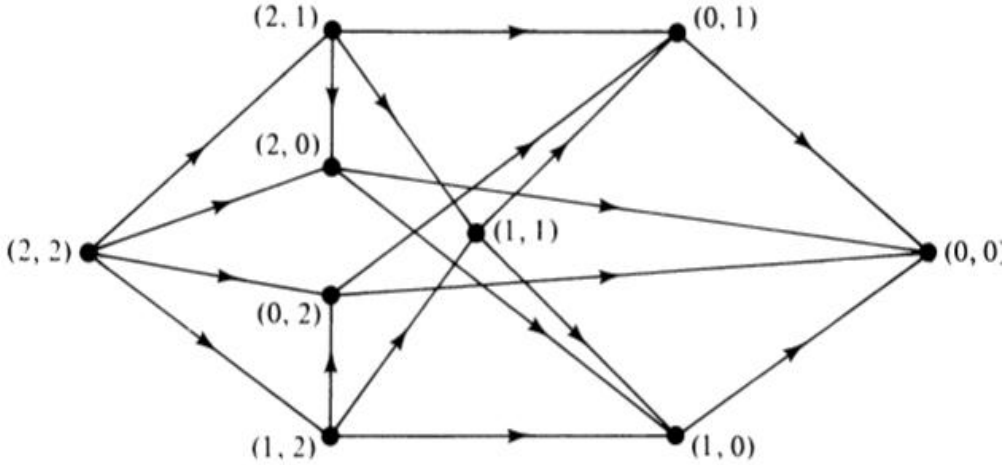
4.a. Describe an algorithm to find all directed circuits of a digraph with suitable example. 7

b. Explain how a graph is presented and stored in computers. 7

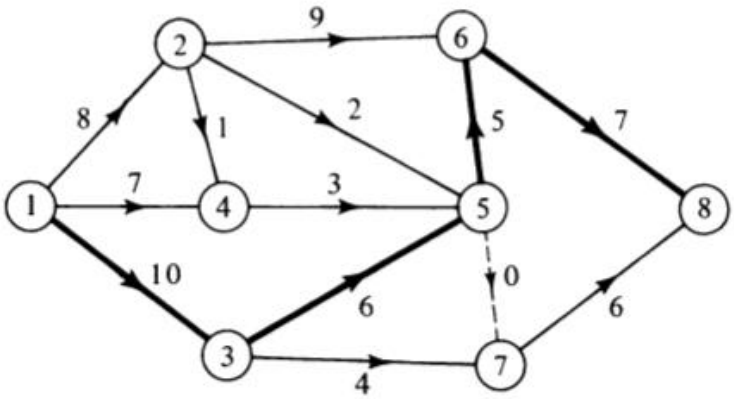
5.a. Prove that every acyclic digraph has unique kernel. 7

b. Explain uses of graphs in Coding theory. 7

6.a. Find an acyclic digraph in the following graph : 14

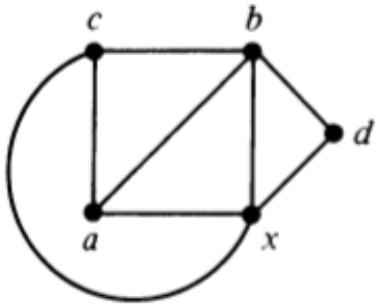


7. Describe an algorithm to fnd critical path and hence project duration of an activity network and employ the same to find CPM in the following graph



14

8.a. Describe DFS algorithm and illustrate how it is applied to the following graph



7

b. Prove that there are n^{n-2} labeled trees with n vertices $(n \geq 2)$ 7

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