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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

B TECH V SEMESTER CIE-II EXAMINATIONS, FEBRUARY- 2024

Regulation: UG20

COMPETITIVE PROGRAMMING USING GRAPH ALGORITHMS

(COMMON TO CSE | IT | CSIT | CSE (AI&ML) | CSE (DS) | CSE (CS))

Time: 2 Hours

Max Marks: 20

Answer any FOUR questions

All parts of the question must be answered in one place only

1. (a) Describe in detail about the Cayley's formula. List the properties of binary tree.
[BL: Understand| CO: 4|Marks: 2]
- (b) Explain the terms center and centroids of a tree. Support your explanation with a diagram.
[BL: Understand | CO: 4|Marks: 3]
2. (a) What is Hamilton graph and write its necessary conditions and also show that Hamilton path is a spanning tree.
[BL: Understand| CO: 5|Marks: 2]
- (b) List the types of complete digraphs. Write notes on complete digraphs, strongly connected and weakly connected digraphs
[BL: Understand| CO: 5|Marks: 3]
3. (a) What is meant by concept of connectedness in a digraph? Explain strongly connected, unilaterally connected and weakly connected digraphs.
[BL: Understand | CO: 5|Marks: 2]
- (b) Give an example of a connected graph that has
 - i) Neither an Euler circuit nor a Hamilton cycle.
 - ii) An Euler circuit but an Hamilton cycle.
 - iii) A Hamilton cycle but no Euler circuit.
 - iv) Both a Hamilton cycle and an Euler circuit.
[BL: Apply| CO: 5|Marks: 3]
4. (a) Discuss about crossing number of a planar graph. Give the relation between degree of a region and number of edges of a planar graph.
[BL: Understand| CO: 6|Marks: 2]
- (b) Summarize about embedding of a graph. Explain Kuratowski's first and second graph.
[BL: Understand | CO: 6|Marks: 3]
5. (a) Describe algorithm to find a proper edge coloring of a bipartite graph.
[BL: Understand| CO: 6|Marks: 2]
- (b) Write Euler's formula for a connected planar graph. Show that in any connected simple planar graph G with n vertices e edges and r regions,
 - i) $e \geq 3/2 r$
 - ii) $e \leq 3n - 6$
 - iii) if G is triangle free, then show that, $e \leq 2n - 4$.
[BL: Apply | CO: 6|Marks: 3]

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