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GIET UNIVERSITY, GUNUPUR – 765022
M. Sc. (Third Semester) Examinations, December – 2022
20MTPE303 - Graph Theory
(Mathematics)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A**(2 x 10 = 20 Marks)**

Q.1. Answer ALL Questions	CO#	Blooms Level
a. Define Cut edge and Bond.	CO1	K2
b. Discuss about isomorphism of two graphs with examples.	CO1	K1
c. Define the terms vertex cut and edge cut.	CO2	K1
d. Define the isolated vertex and pendent vertex of a graph.	CO1	K1
e. Discuss briefly about blocks and internally disjoint paths.	CO1	K2
f. Define a tree with an example.	CO1	K1
g. Define cycle and Hamiltonian cycle.	CO2	K1
h. Is it true that every 2-chromatic graph is a tree? If it is so, then why and if it is not, then what is the characterization of a 2-chromatic graph?	CO1	K1
i. Define planar graph and region in planar graph.	CO1	K1
j. Define a planar graph and give the necessary and sufficient condition for the graph has dual.	CO1	K2

PART – B**(10 x 5 = 50 Marks)**

<u>Answer ANY FIVE questions</u>	Marks	CO#	Blooms Level
2.a. Prove that Connectedness in a graph is an equivalence relation.	7	CO2	K2
b. Draw a graph in which the length of the longest cycle is 9 and the length of the shortest cycle is 4.	3	CO2	K3
3. Prove that, a graph G with $v \geq 3$ is 2-connected if and only if any two vertices of G are connected by at least two internally disjoint paths.	10	CO2	K3
4.a. Prove that, in a tree, any two vertices are connected by a unique path.	7	CO2	K1
b. If G is a connected graph with n vertices and $n-1$ edges, prove that G is a tree	3	CO2	K1
5. Prove that a connected graph has an Euler trail if and only if it has at most two vertices of odd degree.	10	CO2	K2
6.a. Prove that, a connected graph is a tree iff every edge is a cut edge.	7	CO2	K2
b. Write Hierholzer's algorithm to construct an Euler tour in an Euler graph G	3	CO4	K2
7.a. Prove that, if G is Hamiltonian graph, then for every non-empty proper subset S of V , $\omega(G-S) \leq S $.	7	CO3	K2
b. Write BFS to find a path from a vertex s to a vertex t	3		
8. Every tree with two or more vertices is 2 chromatic.	10	CO4	K2

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