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COER University

END SEMESTER EXAMINATION, EVEN SEM 2022-23

Time : 3 hours Program Name : B.Tech.(Hons.)-CSE,CSE(AI & ML), CSE(Cyber Security) Course Name : Graph Theory Note: All questions are compulsory. No student is allowed to leave the examination hall before the completion of the time.

Total Marks : 100 Semester : IV Course Code : SOS 202

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Q. No 1	Attempt Any Four Parts, Each Question Carries 5 Marks.	CO	BL
(a)	Prove that a simple graph with n vertices and k components can have at most (n-k) ($n-k+1$)/2 edges?	CO 1	3
(b)	Define the Hamiltonian path? Find an example of a non Hamiltonian graph with a Hamiltonian path?	CO 1	1
(c)	Prove that a connected graph G remains connected after removing an edge e from G if and only if e belongs to some circuit in G	CO 1	3
(d)	Define isomorphism of graphs? For the following pair of graphs, determine whether or not the graphs are isomorphic. Explain your answer?	CO 1	1
(e)	Prove that in a graph the number of the vertices with odd degree is even?	CO 1	3
Q. No 2	Attempt Any Four Parts, Each Question Carries 5 Marks.	СО	BL
(a)	Define fundamental circuit and fundamental cut-sets.	CO 2	1
(b)	Prove that, a graph G with n vertices has n-1 edges and no circuits are connected.	CO 2	3
(c)	If G is tree with n vertices then prove that it has exactly n-1 edges?	CO 2	3
(d)	Define spanning tree of a graph? Show that a Hamiltonian path in a graph is a spanning tree?	CO 2	1
(e)	Prove that for a graph G with n vertices and e edges vertex connectivity <= edge connectivity <= 2e/n	CO 2	3
Q. No 3	Attempt Any Four Parts. Each Question Carries 5 Marks.	CO	B
(a)	Define a planar graph? State and prove the Euler's formula for a planar graph?	CO 3	1
(b)	Define self dual graph with suitable example	CO 2	-

(a)	Define a planar graph? State and prove the Euler's formula for a planar graph?	CU 3	1	۱
(b)	Define self dual graph with suitable example.	CO 3	1	1
(c)	Show that a complete graph k_n is planar if $n \le 4$?	CO 3	3	1
(d)	Define thickness and crossing number of a graph? Find thickness and crossing numbers of the graph k_3 and $K_{3,3}$?	CO 3	1	
(e)	Discuss different steps to check the planarity of a graph.	CO 3	3	
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Q. No 4	Attempt Any Two Parts. Each Question Carries 10 Marks.	CO	BL
(a)	A graph of n vertices is a complete graph if and only if its chromatic polynomial is	CO 4	3
.,	$P_n(\lambda) = \lambda(\lambda - 1)(\lambda - 2) \dots (\lambda - n + 1)$		
(b)	Define the following with one example each :	CO 4	1
. ,	a) Chromatic partitioning		
	b) Uniquely colorable graph		
	c) Maximal independent set.		
	d) Covering		
	e) Matching		
(c)	State and prove four color theorem.	CO 4	3

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	Attended To The Fride Convice 10 Marks	CO	BL
(a)	Attempt Any Two Parts. Each Question Carries 10 Marks. Define reduced matrix A_f , fundamental circuit matrix B_f and the fundamental cut-set matrix C_f of a connected graph G with n vertices and e edges. Derive the relationship	CO 5	1
(b)	Define the circuit matrix B (G) of a connected graph G with n vertices and e edges? Prove that the rank of B (G) is $e_n n \pm 12$	CO 5	1
(c)	Define the adjacency matrix A (G) of a simple graph G? Prove that two graphs G_1 and G_2 are isomorphic if and only if A (G_1) and A (G_2) differ only by the permutations of rows and columns?	CO 5	1
	End of Paper		
(c)	Define the adjacency matrix A (G) of a simple graph G? Prove that two graphs G ₁ and G ₂ are isomorphic if and only if A (G ₁) and A (G ₂) differ only by the permutations of rows and columns?	CO 5	

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