Course Code: 23BS3T04

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II-B.TechI-Semester Regular Examinations (BR23), November - 2024

Discrete Mathematics and Graph Theory (CSE, CSE AI&DS, AI&ML)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-AandPart-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Prove that $\sim(p \rightarrow q)$ and $p \wedge \sim q$ are logically equivalent.	(2M)	CO1	BL5
b)	How can the English statement be translated into a logical expression "You Cannot ride the roller coaster if your under 4 feet tall unless you are older than 16 years old".	(2M)	CO1	BL2
c)	Draw Hasse diagram representing the partial ordering on {(a,b)/a divides b} on {2,3,6,24,36,48}.	(2M)	CO2	BL4
d)	If A={1,2,3,4} and R,S are relations on A defined by R={(1,2),(1,3),(2,4),(4,4)},S={(1,1),(1,2),(1,3),(1,4),(2,3),(2,4)} find their matrices.	(2M)	CO2	BL1
e)	State the Pigeon hole principle	(2M)	CO3	BL1
f)	Find the number of arrangements of the letters of MISSISSIPPI.	(2M)	CO3	BL1
g)	Briefly explain about Multigraph with suitable example.	(2M)	CO4	BL2
h)	Define Euler circuit, Hamilton cycle.	(2M)	CO4	BL1
i)	What is the chromatic number of the following i) K_n ii) $K_{m,n}$	(2M)	CO5	BL1
j)	Define Planar graph and give an example	(2M)	CO5	BL1

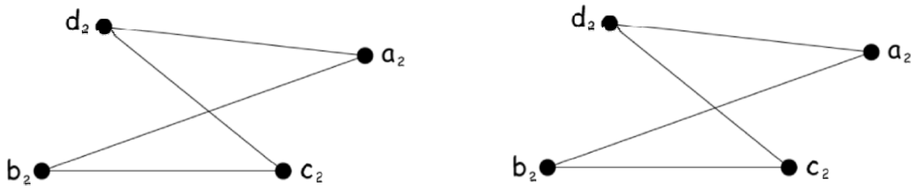
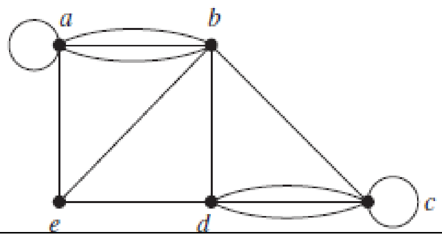
PART–B (5X10 = 50M)

2a.	Prove that $\big((P \vee Q) \wedge \sim(\sim P \wedge (\sim Q \vee \sim R))\big) \vee (\sim P \wedge \sim Q) \vee (\sim P \wedge \sim R)$ is a tautology.	5(M)	CO1	BL5
b.	Test the validity of the following argument: "All dogs are barking, some animals are dogs. Therefore, some animals are barking".	5(M)	CO1	BL4
	(OR)			
3a.	Obtain the PCNF OF $P \vee (\sim P \rightarrow (Q \vee (\sim Q \rightarrow R)$.	5(M)	CO1	BL5
b.	Show that the premises "A Student in this class has not read the book", and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book".	5(M)	CO1	BL5

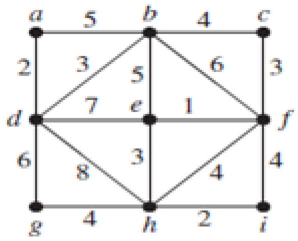
4a.	Given the functions $f(x) = x + 2$ and $g(x) = x - 2$, find the compositions fog and gof.	5(M)	CO2	BL2
b.	If A={1,2,3,4} and P={{1,2},{3},{4}} is a partition of A. Find the Equivalence relation determined by P.	5(M)	CO2	BL1
	(OR)			
5a.	Given the functions $f(x) = 2x + 1$ and $g(x) = x^2$ find the compositions fog	5(M)	CO2	BL2

	and gof.			
b.	Prove that (S, ≤) is a Lattice, where S= {1,2,5,10} and ≤ is for divisibility. Prove that it is alsoa Distributive Lattice?	5(M)	CO2	BL5

6a.	Find the coefficient of (i) $x^3y^2z^2$ in $(2x - y + z)^9$, (ii) x^6y^3 in $(x - 3y)^9$.	5(M)	CO3	BL3
b.	Solve the recurrence relation $a_n + a_{n-1} - 6a_{n-2} = 0$ for $n \geq 2$. given $a_0 = -1, a_1 = 8$.	5(M)	CO3	BL3
	(OR)			
7a.	Solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2} = 0$ for $n \geq 2$. given $a_0 = -3, a_1 = -10$.	5(M)	CO3	BL3
b.	Define generating functions. Determine the generating function for the sequence $a_n = 2^n$ for n≥0.	5(M)	CO3	BL5

8a.	Suppose that G is a non directed graph with 12 edges. Suppose that G has 6 vertices of degree 3 and the rest have degree less than 3. Determine the minimum number of vertices G can have.	5(M)	CO4	BL5
b.	Show that the two graphs given below are isomorphic. 	5(M)	CO4	BL4
	(OR)			
9a.	Find the number of vertices, the number of edges, and the degree of each vertex in the given undirected graph. Identify all isolated and pendant vertices. 	5(M)	CO4	BL1
b.	Explain the step by step procedure to verify whether two graphs are isomorphic or not with an example.		CO4	BL4

10a	Explain Breadth First Search Algorithm with suitable example.	5(M)	CO5	BL3
b.	Explain Kruskal's algorithm to find the minimal spanning tree with an example.	5(M)	CO5	BL3
	(OR)			
11a	Use Prim's algorithm to find a minimum spanning tree in the graph	5(M)	CO5	BL3

				
b.	Explain Depth First Search Algorithm with suitable example.	5(M)	CO5	L3

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