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End Semester Back Examination- 2024

Name of Course: BCA/B.Sc IT

Semester: II

Name of the Paper: Discrete Mathematical Structure and Graph Theory

Paper Code: TBC 205 /TBC 206/TBI 206

Time: 3 Hours

Maximum Marks: 100

Note:(i) All questions are compulsory.

(ii) Answer any two sub question from each question.

(iii) Each question carries 20 marks.

Q1	2*10 marks	
(a)	Show that the given equations are consistent and solve $\begin{aligned}x + y + z &= 6 \\x + 2y + 3z &= 14 \\x + 4y + 7z &= 30\end{aligned}$	CO1
(b)	Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$	
(c)	Find the rank of the following matrices. $A = \begin{pmatrix} 1 & 1 & 2 \\ 2 & 0 & 1 \\ 0 & 1 & 1 \end{pmatrix} \quad B = \begin{pmatrix} -2 & 3 & 3 \\ 3 & -4 & 1 \\ -5 & 7 & 2 \end{pmatrix}$	
Q2	2*10 marks	
(a)	Draw the logic circuit for the following expression. (i) $A'B + AB'$ (ii) $(A+B).(A+C')$	CO2
(b)	Use Karnaugh map to simplify the following expression (i) $X = AB'C + A'B + AC' + ABC$ (ii) $X = C'D' + CD + CD'$	
(c)	Convert the given Boolean expression in SOP and POS. $F = A'B + AB' + AB$	
Q3	2*10 marks	
(a)	What is the degree of a vertex in a graph. Show that the maximum number of edges in a simple graph G with p vertices is $p(p-1)/2$	CO3
(b)	Define travelling salesman problem and Konigsberg bridge problem.	
(c)	Define multigraph, pseudo graph, regular graph, complete graph, and bipartite graph. Give one example of each of the graph.	
Q4	2*10 marks	CO4
(a)	Write a short note on the following (i) Planar graph	

	(ii) Cut set and cut vertex (iii) Component and Fragment (iv) Indegree and Outdegree in a directed graph	
(b)	Define chromatic number and chromatic polynomial. By using decomposition theorem, find the chromatic polynomial of the following graph. <div style="text-align: center;"> </div>	
(c)	Using the Wetch-Powel algorithm to color the graph G given as below and find chromatic number of G. <div style="text-align: center;"> </div>	
Q5		
(a)	Using Kruskal's algorithm, find a minimal spanning tree for the following weighted graph. Also calculate the total weight of minimal spanning tree. <div style="text-align: center;"> </div>	CO5
(b)	Define binary tree and full binary tree with examples. Prove that the maximum number of vertices in a binary tree of height H is $2^{H+1} - 1$, $H \geq 0$.	
(c)	Define the following with example. <ol style="list-style-type: none"> Rank and nullity in a graph G Rooted tree Full binary tree Height of a binary tree 	