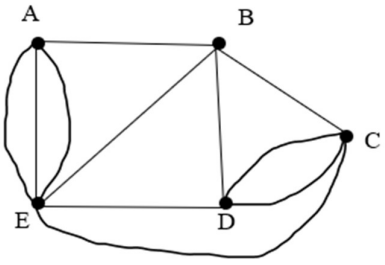
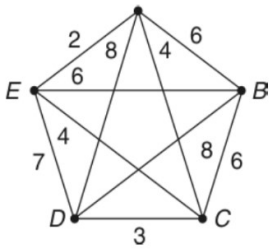
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : III**
BRANCH: CSE **SESSION : MO/2024**

SUBJECT: MA205 DISCRETE MATHEMATICS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Show that $[p \wedge (p \leftrightarrow q)] \rightarrow q$ is a tautology.	[5]	1	3
Q.1(b)	Prove that $(p \rightarrow q) \wedge (q \rightarrow r)$ and $(p \vee q) \rightarrow r$ are logically equivalent.	[5]	1	3
Q.2(a)	Solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + 2^n$.	[5]	2	3
Q.2(b)	Solve the recurrence relation $a_{n+2} - 2a_{n+1} + a_n = 2^n$ by the method of generating functions with initial conditions $a_0 = 2$ and $a_1 = 1$.	[5]	2	4
Q.3(a)	Show that $2xlog(x^2 + 1) = O(x^2)$.	[5]	3	3
Q.3(b)	Given $A = \{1, 2, 3, 4\}$ and R is the relation on A represented by the matrix $M_R = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$. Find the transitive closure of R by using Warshall's algorithm. Write W_0, W_1, W_2, W_3, and W_4 matrices.	[5]	3	4
Q.4(a)	Prove that the set $Z_4 = \{0, 1, 2, 3, 4\}$ is an abelian group under the operation addition modulo 5.	[5]	4	3
Q.4(b)	Find the minimum distance of the (2,4) encoding function $e: B^2 \rightarrow B^4$ defined by $e(00) = 0000, e(01) = 0110, e(10) = 1011, e(11) = 1100$.	[5]	4	3
Q.5(a)	Determine whether the flowing graph is a Euler graph or not. Construct a Euler circuit if it is a Euler graph. 	[5]	5	3
Q.5(b)	Use Prim's algorithm to find a minimal spanning tree (MST) for the following weighted graph. Find the weight of the MST. 	[5]	5	4

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