BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION SP2023)

CLASS: BTECH **SEMESTER: SP/2023**
BRANCH: CSE/IT **SESSION: MORNING**

SUBJECT: CS241 DESIGN AND ANALYSIS OF ALGORITHM

TIME: 03 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*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

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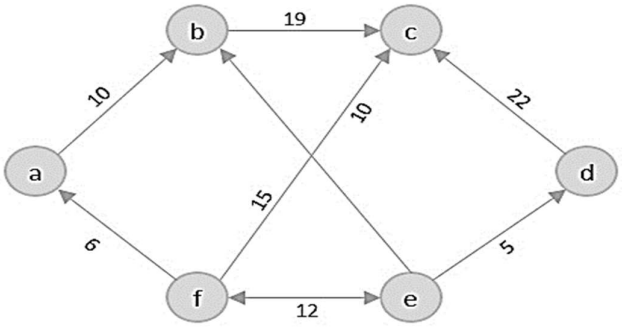
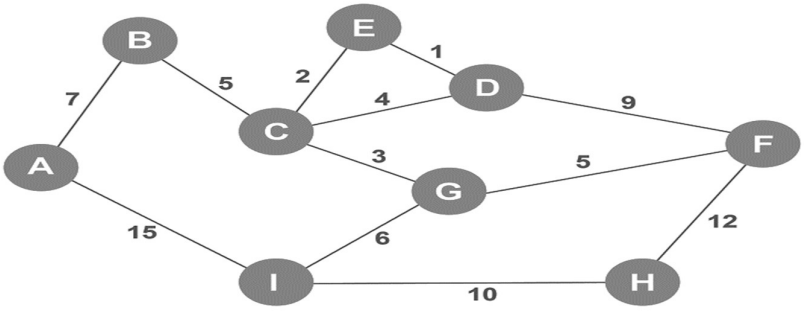
Q.1(a)	Solve the following using Recursion Tree method: $T(n) = 4T(n/2) + n^4$ $T(n) = 4T(n/2) + n$	[5]	CO1
Q.1(b)	Solve the following recurrence relations using Master Theorem. $T(n) = 3T(n/2) + n^2$ $T(n) = T(n/2) + 2^n$ $T(n) = 16T(n/4) + n$ $T(n) = 2T(n/2) + n\log n$	[5]	CO1
Q.2(a)	Write an Algorithm to compute the complexity of Matrix Multiplication in $O(n^{2.81})$	[5]	CO2, CO3
Q.2(b)	Explain the concept of Transform and Conquer strategy taking the example of AVL Tree	[5]	CO3
Q.3(a)	Using Dynamic Programming approach find the Longest Common Subsequence between the following two strings: X = abaaba Y = babbab	[5]	CO2, CO4
Q.3(b)	Find the solution to the following Travelling Salesman Problem using Dynamic Programming approach. Consider vertex 'a' as the source vertex.	[5]	CO2, CO4



Q.4(a)	Find the Minimum Spanning Tree of the following graph using both Prim's and Kruskal's Algorithm. Consider vertex 'a' as the source vertex. Which among the two in your view is better for getting the MST and why?	[5]	CO2, CO4



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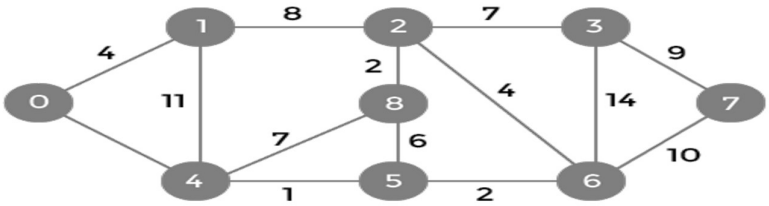
Q.4(b) Find the shortest path from source ‘a’ of the following graph using Dijkstra Algorithm. What are the drawbacks of this algorithm? [5] CO2, CO4



Q.5(a) Define the classes ‘P’ ‘NP’, ‘NP – Hard’ and ‘NP - Complete’. What do you mean by a Decision Problem and an Optimization Problem? [5] CO5

Q.5(b) Prove that the Max Clique Problem is NP – Hard. [5] CO5

::::::26/04/2023::::::M