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

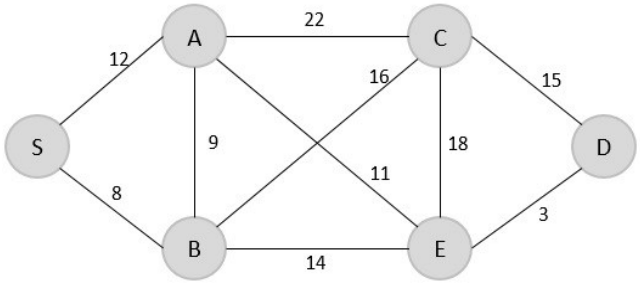
CLASS: BTECH **SEMESTER : IV**
BRANCH: BT/CE/FT/ECE/EEE/MECH/PIE **SESSION : SP/2025**

SUBJECT: CS261 FUNDAMENTAL OF DATA STRUCTURES

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)	What is the difference between Big O, Big Ω, and Big Θ?	[2]	1	1
Q.1(b)	Check if a matrix is sparse and explain the criteria. Discuss real-life applications where sparse matrices are encountered.	[3]	5	4
Q.1(c)	If $f(n) = 3n^2 + 5n + 7$, what is its Big O complexity?	[5]	1	4
Q.2(a)	Definition of circular queue, and Dqueue	[2]	2	1
Q.2(b)	Write an algorithm to reverse a stack using recursion.	[3]	4	3
Q.2(c)	Infix to postfix and prefix of the below expression A + B * (C ^ D - E) ^ (F + G * H) - I	[5]		4
Q.3(a)	Provide the advantages and disadvantages of linked lists?	[2]	2	2
Q.3(b)	Select the most suitable linked list for simulating a traffic light and explain.	[3]	4	3
Q.3(c)	Write an algorithm for performing the insertion operation at any point in a doubly linked list and explain how it works.	[5]	4	3
Q.4(a)	Construct the minimum spanning tree and the minimum the cost for the below graph using Prim's Algorithm. Starting Point is S.	[5]	5	5



Q.4(b)	Use the above graph and show the BFS and DFS of the graph given S is the source node and D is the destination node.	[5]	2	5
Q.5(a)	Determine the number of passes required by the insertion sort algorithm for n numbers and explain the reasoning.	[2]	3	3
Q.5(b)	Write an algorithm for linear search and compute its time complexity. Compare its efficiency with other search algorithms like binary search.	[3]	3	5
Q.5(c)	Given the elements 23, 56, 12, 89, 34, 77, 5, 8, 92, 61, implement a binary max heap using an array. Construct the max heap. Find out the array after two deletion operations.	[5]	4	4

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