MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. MAKE UP EXAMINATION

JANUARY 2024

SUBJECT: DATA STRUCTURES AND ALGORITHMS [MTE 2151]

Max. Marks: **50**

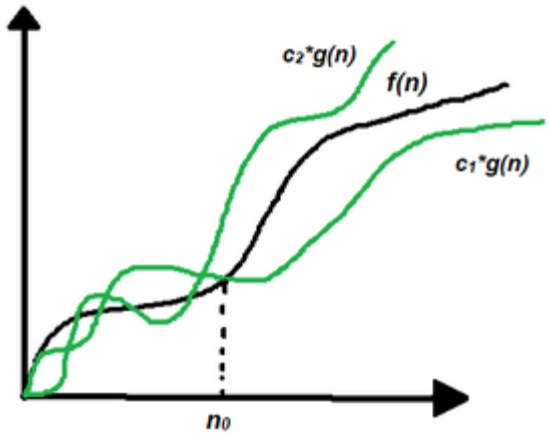
Instructions to Candidates:

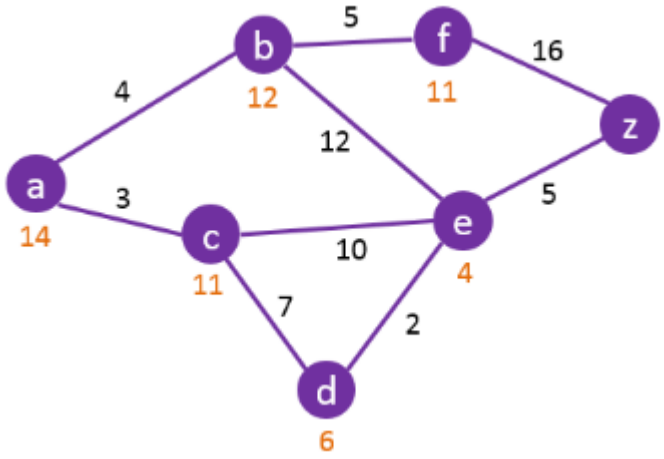
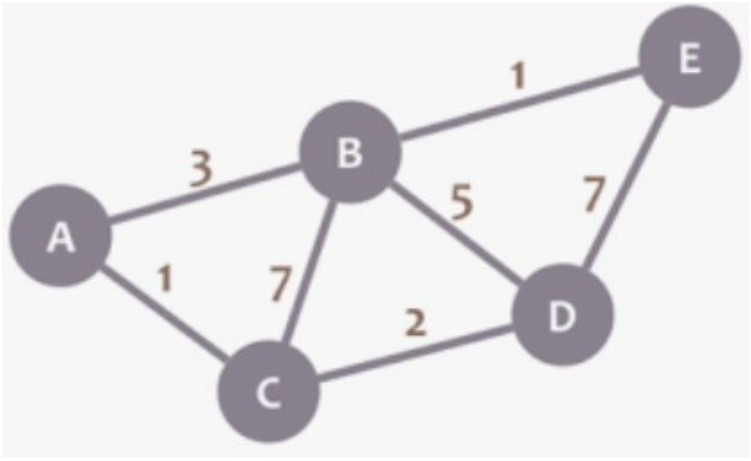
- Answer ALL the questions & missing data may be suitably assumed

Q.NO.	QUESTION	M	CO	PO	LO	BL
1.	Illustrate the ENQUEUE and DEQUEUE operations on a Queue	2	1	1, 2, 3, 4, 5, 12	1, 2	4
2.	Illustrate the process of converting a decimal number into a binary number and further how a stack may be employed for the same purpose.	3	1	1, 2, 3, 4, 5, 12	1, 2	3,4
3.	Develop an algorithm for deletion of a particular node in a doubly linked list using Tail pointer. Use sample data to support your answer.	5	2	1, 2, 3, 4, 5, 9, 12	1, 2, 12, 16, 17	6
4.	Develop an algorithm to find the product of all the elements in an array of size 5	2	2	1, 2, 3, 4, 5, 9, 12	1, 2, 12, 16, 17	6

5.	Compute the time complexity of the code snippet given below.
	int a = 0;
	for (i = 0; i < N; i++) {
	for (j = N; j > i; j--) {
	STATEMENTS;
	}
	}
		3	2	1, 2, 3, 4, 5, 9, 12	1, 2, 12, 16, 17	4

6.	Create an AVL tree with the nodes 10, 25, 4, 56, 89, 37, 92	5	2	1, 2, 3, 4,	1, 2, 12,	6

				5, 9, 12	**16, 17**	
7.	Elucidate the difference between Lists, Sets, Tuples and Dictionaries using suitable examples.	**2**	**2**	**1, 2, 3, 4, 5, 9, 12**	**1, 2, 12, 16, 17**	**3,4**
8.	Explain how the number of inputs would contribute to the time complexity of an algorithm as opposed to the length of each input.	**3**	**3**	**1, 2, 5, 12**	**1, 2, 3**	**4**
9.	Perform Quick sort and Heap sort on the elements 10, 25, 4, 56, 89, 37, 92	**5**	**3**	**1, 2, 5, 12**	**1, 2, 3**	**4**
10.	Correlate the time complexities of the three functions given in the following graph. Give suitable reasons for your choice.  Figure 10	**2**	**3**	**1, 2, 5, 12**	**1, 2, 3**	**4**
11.	Consider the problem of searching for genes in DNA sequences using Horspool's algorithm. A DNA sequence consists of a text on the alphabet {A, C, G, T} and the gene or gene segment is the pattern. a. Construct the shift table for the following gene segment of your chromosome 10: **TCCTATTCTT** b. Locate the above pattern in the following DNA sequence: **TTATAGATCTCGTATTCTTTTATAGATCTCCTATTCTT**	**3**	**4**	**1.2, 3, 12**	**1, 2, 3**	**4**
12.	Estimate the time complexity for the following operations on an array. Support your answer with suitable illustrations of the algorithm. a. Push back b. Push front c. Pop front d. Top front	**5**	**4**	**1.2, 3, 12**	**1, 2. 3**	**4**

	e. Find					
13.	Deduce the shortest path from A to Z using the A* algorithm.  Figure 13	**2**	**5**	**1.2, 3, 12**	**1, 2, 3**	**4**
14.	Compute the shortest path from Node A to Node D using the Dijkstra's algorithm.  Figure 14	**3**	**5**	**1.2, 3, 12**	**1, 2, 3**	**4**
15.	Perform Depth First Search on the graph shown below.	**5**	**5**	**1.2, 3, 12**	**1, 2, 3**	**4**

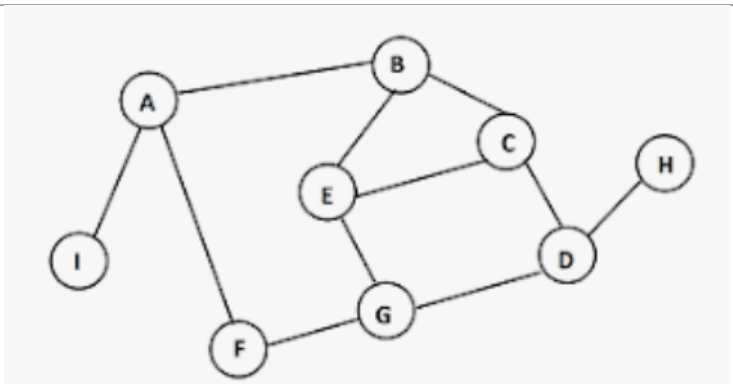


Figure 15