Name: Enrolment No:	![UPES logo] UPES UNIVERSITY OF TOMORROW

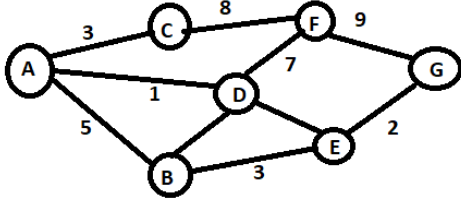**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
End Semester Examination, Dec 2022

Course: Data Structures   Semester: I
Program: MCA   Time: 03 hrs.
Course Code: CSEG7015   Max. Marks: 100

Instructions: All questions are to be attempted. There are internal choices in Q.N. 9 and 11.

	SECTION A (5Qx4M=20Marks)		
S. No.		**Marks**	**CO**
Q 1	Discuss the importance of data structures. Give some example of data structures.	**4**	**CO4**
Q 2	Give one line definition for following with respect to Stack/Queue a. Push b. Pop c. Enqueue d. Dequeue e. Peek	**4**	**CO1**
Q 3	An array of distinct elements is to be sorted using quicksort. Assume that the pivot element is chosen uniformly at random. What is the probability that the pivot element gets placed in the worst possible location in the first round of partitioning.	**4**	**CO2**
Q 4	Which data structures is used in the following scenarios. a. Facebook to suggest mutual friends. b. Sending Emails. c. Undo and redo Buttons. d. Left and right Swipe on popular dating website. e. Contacts in a cell phone	**4**	**CO4**
Q 5	Define what is a binary tree, mention its various type.	**4**	**CO3**
	SECTION B (4Qx10M= 40 Marks)		
Q 6	A hash table contains 7 buckets and uses linear probing to solve collision. The key values are integers and the hash function used is key%7. Draw	**10**	**CO2**

	the table that results after inserting in the given order the following values: 16,8,4,13,29,11,22.		

Q 7	Derive the time complexity for given expressions.
	
	a.
	
	```\nint a = 0, i = N;\nwhile (i > 0)\n {\n a += i;\n i /= 2;\n }\n```
	
	b.
	```\nvar value = 0;\nfor(var i=0;i<n;i++)\n for(var j=0;j<i;j++)\n value += 1;\n```
	
	c.
	```\nint a = 0, b = 0;\nfor (i = 0; i < N; i++)\n{\n a = a + rand();\n}\nfor (j = 0; j < M; j++)\n{\n b = b + rand();\n}\n```
		4+3+3	CO1

Q 8	Write a routine to check for a balanced parentheses in an expression using stack.	10	CO1
Q 9	Write algorithm to insert a node at specified location in a singly linked list data structure.	10	CO2
	OR		
Q9	For the given input values 478, 537, 9, 721, 3, 38, 143, 67, sort them using radix sort. Determine total time which be undertaken to implement it.	10	CO2
SECTION-C **(2Qx20M=40 Marks)**			

Q 10	Write a C program to determine all the solution of 'N' Queen Problem. The N Queen is the problem of placing N chess queens on an N×N chessboard so that no two queens attack each other.	20	CO4
Q 11	Consider the graph to answer the following question. a. Determine MSP using Kruskal for the given graph. b. Differentiate between Prim and Kruskal algorithm. c. Mention the scenario when Prim and Kruskal would not yield the same graph.	12+4+4=20	CO3
	OR		

Q11	1. Write short notes on following:
	  a. AVL
	  b. Threaded Binary Tree
	2. Write a routine for deleting a node from the binary search tree.
		5+5+10	CO3