Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Course: Design and Analysis of Algorithms
Program: BTech-CSE- IOT&SC
Course Code: CSEG2003

Semester: III
Time : 03 hrs.
Max. Marks: 100

Instruction: Attempt all questions. Internal choice is given, where ever applicable.

SECTION A

S. No.		Marks	CO

Q 1	What is the output of following program?
	`#include<stdio.h>`
	`void print(int n)`
	`{`
	`   if (n > 4000)`
	`      return;`
	`   printf("%d ", n);`
	`   print(2*n);`
	`   printf("%d ", n);`
	`}`
	
	`int main()`
	`{`
	`   print(2000);`
	`   getchar();`
	`   return 0;`
	`}`
		5	**CO1**

Q 2	The time complexity of the recurrence relation T(m) = T(3m / 4) + 1 is ______________	**5**	**CO1**
Q 3	Let G be connected undirected graph of 100 vertices and 300 edges. The weight of a minimum spanning tree of G is 1500. When the weight of each edge of G is increased by five, the weight of a minimum spanning tree becomes ____ _________.	**5**	**CO3**
Q 4	If every square of the board is visited, then the total number of knight moves of 4-queen problem is (A) 14 (B) 15 (C) 16 (D) 12	**5**	**CO4**
Q 5	In Strassen's Multiplication Algorithm the T(n) is a) $7T(n) + bn^2$ b) $7T(n/2) + bn^2$ c) $8T(n/2) + bn^2$ d) $7T(n/2) + bn$	**5**	**CO1**
Q 6	If one uses straight two-way merge sort algorithm to sort the following elements in ascending order 20, 47, 15, 8, 9, 4, 40, 30, 12, 17 then the order of these elements after the second pass of the algorithm is _________________:	**5**	**CO2**

	SECTION B		
Q 1	Consider two strings A = "qpqrr" and B = "pqprqrp". Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B. Then calculate the value of x + y .	**10**	**CO4**
Q 2	You are given an array of n elements, and you notice that some of the elements are duplicate; that is, they appear more than once in an array. Write an algorithm to remove all duplicates from the array in O(1) space complexity.	**10**	**CO2**
Q 3	A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency: character Frequency a 15 b 19 c 12 d 13 e 16 f 45 Each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message?	**10**	**CO2**
Q 4	Let m=31 and W= {7, 11, 13, 24}. Draw a portion of state space tree for solving sum of subset problem for the above given problem.	**10**	**CO3**
Q 5	Explain the P, NP, NP-hard, NP-complete classes? Give relationship among them?	**10**	**CO5**
	SECTION-C		
Q 1	Let A1, A2, A3, A4, A5 and A6 be five matrices of dimensions 100 x 50, 50 x 200, 200 x 100, 100 x 50, 50 x 400 respectively. Find the minimum number of scalar multiplications required to find the product A1A2A3A4A5 using the basic matrix multiplication and also find the order of multiplication.	**20**	**CO4**

	OR		
	Mr. X wants to construct a map between the major cities of Uttarakhand. The direct distance between the cites is given. Construct the table contains distance between each possible pair of cities. The given direct distance is: a) Dehradun to Nainital = 289km b) Dehradun to Roorkee = 73km c) Dehradun to Haridwar = 53km d) Dehradun to Mussoorie = 34km e) Dehradun to Rishikesh = 45km f) Haridwar to Rishikesh = 20km g) Haridwar to Roorkee = 31km	**20**	**CO4**