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SEVENTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2016

CS/PTCS 09 702—DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

I. (a) Identify the basic operation and formulate the recurrence relation for the following code segment.

```
Algorithm Analysis(n)
{
    if(n = 0)
        val ← 1
    else if(n = 1)
        val ← 2
    else
    val ← n + Analysis(n/2)
}
```

(b) Write an algorithm to check whether 2 queens are in the same column and in the same diagonal.

(c) Write the characteristics of Branch and Bound method.

(d) Define P, NP, NP Hard, NP Complete.

(e) Give an example for primality testing.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

II. (a) Show that log n! = θ (n log n)

(b) Write a pseudocode to split a given singly linked list into two equal halves in one pass. Analyse the time complexity of your algorithm. Represent the complexity using asymptotic notations.

(c) Is Selection sort a greedy algorithm ? What are the various functions involved in this method. Illustrate with an example.

Turn over

(d) Present a backtracking algorithm for the 0/1 knapsack problem. Trace the algorithm for the following data set, no, of objects , $n = 4$, capacity of the bag, $m = 15$, Profit P = (10, 10, 12, 18), Weight W = (2, 4, 6, 9).

(e) Write the les vegas algorithm and explain its significance.

(f) Explain 8 queens problem and give a randomized solution for the same.

(4 × 5 = 20 marks)

Part C

Descriptive analytical / Problem solving questions.

III. (a) Solve the following :

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ 8T(n/2) + n^2 & \text{otherwise} \end{cases}$$

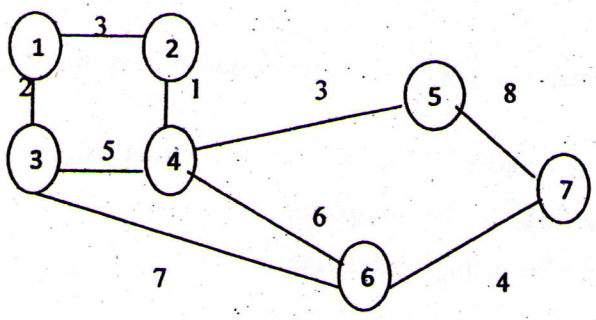
Or

(b) Show that $W(n/3) + W(2n/3) + n$ is $O(n \log n)$ using recursive tree method

IV. (a) Write the divide and conquer algorithm to multiply 2 matrices. Analyse the time complexity.

Or

(b) Find the minimum spanning tree for the following graph using Prims algorithm. Explain how greedy method of algorithm design is used here.



V. (a) Describe the method of solving sum of subsets problem using backtracking with an example.

Or

(b) Solve the following bin packing problem using first fit, best-fit, first fit decreasing and best fit decreasing heuristics : Capacity = 20, Number of objects = 8, Size of the objects are 12, 5, 13, 7, 4, 9, 10 and 4.

VI. (a) Explain the Dixon's integer factorization algorithm with an example.

Or

(b) Give randomized solution for selection and sorting and explain the method in detail.

(4 × 10 = 40 marks)