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BICS-014

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

00304

December, 2016

BICS-014 : DESIGN AND ANALYSIS OF ALGORITHM

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a) Determine the time-complexity of the pseudocode given below, using Big-O notation : 5

```
int psum (int n)
{ int i, partial_sum;
 partial_sum = 0;
 for (i = 1; i < = n; i++)
 { partial_sum = partial_sum + i * i;
 } return partial_sum;
}
```

(b) State Master's theorem. The recursive equation of time-complexity of an algorithm is given by $T(n) = 4 \times T\left(\frac{n}{2}\right) + n^2$. Find the asymptotic bounds of T(n), using Master's theorem. *5*

2. Write the algorithm for Quick Sort. Apply it to sort the following data :

25 10 30 15 20 28

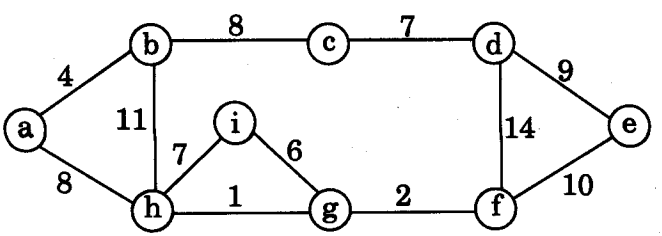
Analyse the performance of Quick Sort. *3+4+3*

3. (a) What is Aggregate Analysis ? A sequence of n operations is performed on a data structure and the i^{th} operation costs i, if i is an exact power of 2 and 1 otherwise. Apply Aggregate Analysis to determine the amortized cost per operation. *5*

(b) Write Strassen's algorithm. Apply it to multiply the following matrices : *2+3*

$$\begin{bmatrix} 5 & 6 \\ -4 & 3 \end{bmatrix} \text{ and } \begin{bmatrix} -7 & 6 \\ 5 & 9 \end{bmatrix}$$

4. Write Kruskal's algorithm. Apply the algorithm to the following graph and find the minimum spanning tree : *2+8*



5. (a) Two algorithms, A_1 and A_2, run on the same machine. The running time of A_1 is $100\ n^2$ and the running time of A_2 is 2^n. Find the value of n, for which A_1 runs faster than A_2. Based on the value of n comment on the performance of A_1 and A_2. *5*

(b) What is fractional knapsack problem ? Consider 5 items along with their respective weights (w) and values (v), given below :

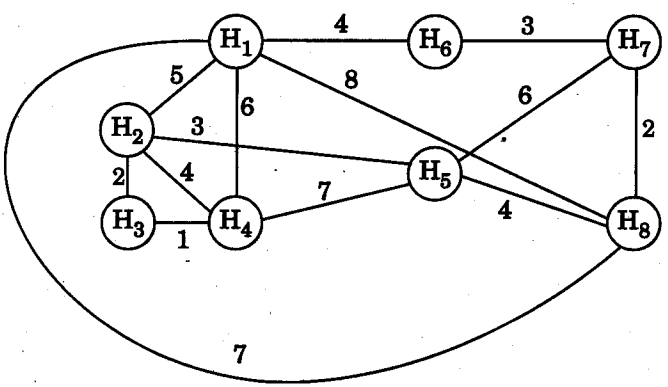
$$I = < I_1, I_2, I_3, I_4, I_5 >$$

$$w = < 5, 10, 20, 30, 40 >$$

$$v = < 30, 20, 100, 90, 160 >$$

The capacity of knapsack W = 60. Find the solution to the fractional knapsack problem. *5*

6. Discuss the Travelling Salesman Problem. Use it to compute the minimum travel cost, for the tour plan of the sales agent, shown below : *4+6*



7. Write short notes on any ***two*** of the following : *2×5=10*

   (a) Knuth-Morris-Pratt Algorithm

   (b) CYK Algorithm

   (c) Monte Carlo Algorithm

8. Briefly discuss the following complexity classes with suitable examples : *5×2=10*

   (a) P

   (b) NP

   (c) co-NP

   (d) NP-Hard

   (e) NP-Complete

9. (a) Explain the term Matroids, with suitable example. *5*

   (b) Explain Huffman coding, with suitable example. *5*

10. Write the iterative and recursive algorithms to find the sum of n integers. Compare the complexity of the algorithms. *3+3+4*