DIPLOMA – VIEP – COMPUTER SCIENCE AND ENGINEERING (DCSVI) / ADVANCED LEVEL CERTIFICATE COURSE IN COMPUTER SCIENCE AND ENGINEERING (ACCSVI)

Term-End Examination

June, 2017

00764

BICS-029 : ALGORITHMS AND LOGIC DESIGN

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any* **five** *questions. Question number 1 is* **compulsory** *which has multiple choice questions. Each question carries equal marks.*

1. Choose the correct answer from the given alternatives : 7×2=14

   (a) Recursive algorithms are based on

      (i) Top-down approach

      (ii) Bottom-up approach

      (iii) Heuristic approach

      (iv) All of the above

(b) Worst case efficiency of Binary search is

(i) $\log_2 n + 1$

(ii) n

(iii) n^2

(iv) 2n

(c) The time complexity of the normal Quick Sort and randomized Quick Sort algorithms in worst case is

(i) $O(n^2)$, $O(n \log_2 n)$

(ii) $O(n^2)$, $O(n^2)$

(iii) $O(n \log_2 n)$, $O(n^2)$

(iv) $O(n \log_2 n)$, $O(n \log_2 n)$

(d) Let there be an array of length 'N', and the Selection Sort algorithm is used to sort it. How many times is a swap function called to complete the execution ?

(i) $N \log_2 N$ times

(ii) $\log_2 N$ times

(iii) N^2 times

(iv) $N - 1$ times

(e) Express the formula $(n - 2) * (n - 4)$ using θ notation.

(i) $\theta(n^2)$

(ii) $\theta(n)$

(iii) $\theta(\log n)$

(iv) None of the above

(f) Worst case efficiency of _____ search is O(n).

    (i) Sequential

    (ii) Binary

    (iii) Indexed

    (iv) Hashing

(g) For analyzing an algorithm, which is the better computing time ?

    (i) O(100 log N)

    (ii) O(N)

    (iii) $O(N^2)$

    (iv) None of the above

2. (a) What are the principles of recursion ? Write a recursive and an iterative algorithm to find the factorial of any number 'n' i.e., n!. Show that $O(n!) = O(n^n)$.   **10**

(b) What are the characteristics of a good algorithm ?   **4**

3. (a) Write the Bubble Sort algorithm. Determine the complexity of Bubble Sort algorithm in Best case, Average case and Worst case. Use Bubble Sort to sort the following sequence in increasing order :   **10**

    5, 11, 21, 6, 14, 8, 12, 28, 32

(b) Prove that the best case for Bubble Sort is the worst case for Quick Sort.   **4**

4. (a) For a given problem P, two algorithms A1 and A2 have respective time complexities $T_1(n)$ and $T_2(n)$ in terms of size n, where $T_1(n) = 4n^5 + 3n$ and $T_2(n) = 2500 n^3 + 4n$. Find the range of n and the size of an instance of the given problem, for which A1 is more efficient than A2. 7

(b) Analyze the data for the number of teams (n) and the number of matches (T_n) given below and determine the value of T_{n+1}, using iterative and recursive approach for designing of algorithms : 7

n : 2 4 8 15 ...
T_n : 1 3 7 14 ...

5. (a) What is an optimization problem ? Is there any relation between optimization problem and dynamic programming ? Explain. 7

(b) Write the recursive binary search algorithm and analyze its run time complexity. 7

6. (a) Apply the Divide and Conquer strategy for finding a biased coin (heavier than the rest of the coins) from a collection of 18 coins by using a two-pan weighing balance ? Write pseudocode for the strategy. 4

(b) Write the Merge Sort algorithm. Explain the execution of Merge Sort with suitable example. Determine the time complexity of Merge Sort in Worst case and Best case. *10*

7. (a) What do you understand by the space complexity and time complexity of any algorithm ? Explain Big-O and Big-Omega notations, with suitable example. *7*

(b) What do you mean by validation and testing of a computer program ? Write down the stages of program development life cycle. *7*

8. Write short notes on the following : *14*

(a) Insertion Sort

(b) Selection Sort

(c) Bucket Sort

(d) Shell Sort