M.Sc. (MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE)
M.Sc. (MACS)

☐☐☐11   **Term-End Examination**

December, 2017

MMTE-002 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 2 hours   *Maximum Marks : 50*

Note : *Answer any **four** questions from questions no. 1 to 5. Question no. **6** is **compulsory**.*

1. (a)   Sort the following numbers using Insertion Sort algorithm showing all the steps :

45, 23, 75, 11, 22, 33

Find the running time of the algorithm.   5

    (b)   Draw a binary search tree for the following inputs :
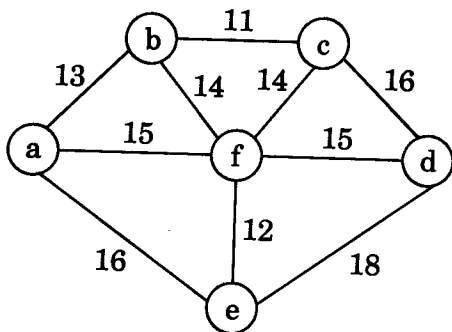
14, 15, 4, 9, 7, 18, 11, 16, 20

Give the pre-order traversal output for the binary search tree you have constructed.   5

2. (a) Construct a Huffman code for the following data : 5

Character	A	B	C	D	E
Probability	0·4	0·1	0·2	0·15	0·15

(b) Draw the minimum spanning tree using Prim's algorithm of the following graph :

At each stage, show the state of the priority queue associated with the algorithm. 5

3. (a) Find an optimal chain parenthesisation of a matrix chain product whose sequence of dimensions is (30, 40, 6, 20, 8). 7

(b) Sort the following list of English words using the Radix Sort algorithm : 3

BAR, CAP, ZAP, APE, TAR, DIG, BIT, TAB, ARC, TEA

4. **(a)** Illustrate the steps of the Rabin-Karp matcher algorithm on the text 294872235748 for the pattern P = 22. Assume that you are working with q = 13. Indicate all the spurious hits. **5**

(b) Show the results of deleting C, P and V, in order, from the B-tree with minimum degree 3 given below : **5**
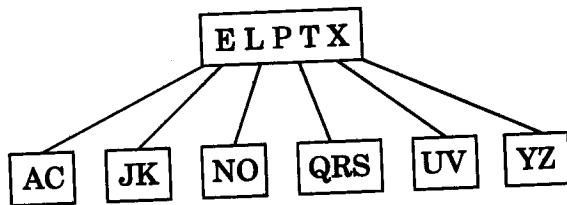
5. **(a)** Write the steps for multiplication of two polynomials of degree n in $\Theta(n \log n)$ time. **5**

(b) For the following network flow, draw the residual network : **5**
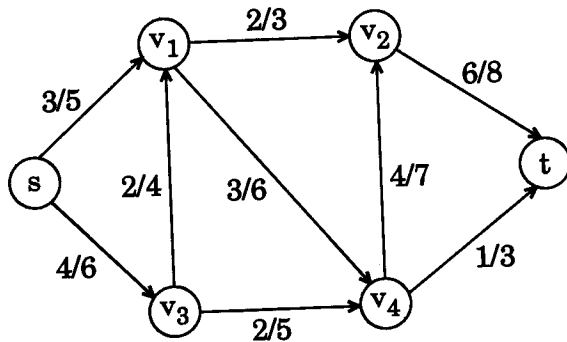
Find the augmenting path p and use it to augment the flow. **5**

6. Which of the following statements are *True* and which are *False* ? Justify your answers. *10*

(a) The time complexity to build a heap with n nodes is O(log n).

(b) Any comparison sorting algorithm requires more computation time than Radix Sort algorithm.

(c) The dynamic programming approach always gives a better solution to any problem in comparison to the Greedy approach.

(d) The Bellman-Ford algorithm can determine shortest paths in any directed graph.

(e) $\phi(n)$ is always even for any natural number $n > 2$, where ϕ is the Euler phi-function.

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