No. of Printed Pages : 3

**MMTE-002** 

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

### M.Sc. (MACS)

#### **Term-End Examination**

## December, 2015

# MMTE-002 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 2 hours

Maximum Marks : 50

Note :	Answer	any	five	questions.	Calculators	are	not
	allowed.						

1.	(a)	Sort t	he	following	numbers	using	Quick	
		sort al	gor	ithm :				

32, 5, 25, 10, 31, 42, 26

- (b) Define B-trees along with conditions. Give an example of a B-tree.
- **2.** (a) Sort the following numbers using Heap sort algorithm :

32, 5, 25, 10, 31, 42, 26

(b) What is the time complexity of Build Max Heap ? Sort the following numbers using Radix sort algorithm :

329, 457, 657, 839, 436, 720, 213, 582

What is the time complexity of Radix sort algorithm?

**MMTE-002** 

P.T.O.

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**3.** (a) What is an optimal Huffman Code for the following set of frequencies ?

Character	a	b	с	d	е	f
Frequency	45	13	12	16	9	5

How many total bits are required to encode the set of characters ?

- (b) Write Kruskal's algorithm in pseudocode. Discuss its time complexity.
- 4. (a) Find an optimal parenthesisation of a matrix-chain product whose sequence of dimensions is (5, 10, 3, 12, 5).
  - (b) How can you implement efficient FIND and UNION operations for disjoint sets ?
- 5. (a) Illustrate all the steps of Rabin-Karp-Miller string matching algorithm for P = 26, T = 3141592653 and Q = 11.
  - (b) For the following network flow, draw the residual network :



Find an augmenting path p and use it to augment the flow along p. Draw the flow network of the augmented flow.

2

5

6

4

7

3

-5

6.

(b) Let  $g(n) = 1^3 + 2^3 + ... + n^3$ . Show that  $g(n) = \Theta(n^4)$  giving the constants.

6

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