INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

III SEMESTER B.S. DEGREE EXAMINATION – OCT. / NOV. 2017

SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS (CS 234)

Saturday, 4 November 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. What is algorithm? Write an algorithm for sequential search and find its best, worst and average time Complexity 6M

1B. Write and explain **INSERTION SORT** algorithm and trace the same for following set of numbers to sort it in ascending order 89,45,68,90,29,34,17. 6M

1C. Explain recursive solution to the Tower of Hanoi puzzle. Draw the recursive call tree. Derive the recurrence relation to the number of moves made in Tower of Hanoi. 8M

2A. Give analgorithm for **MERGESORT** and hence sort the list 8 ,3, 2, 9, 7, 1, 5, 4 in ascending order. 10M

2B. Write a note on NP-Complete problems 4M

2C. Construct AVL tree for the list 5,6,8,3,2,4,7 step-by-step. Mention balance factor and type of rotation at each stage if there is any rotation required. 6M

3A. Write and explain brute force technique of String matching algorithm. Give its time complexity in best and worst case. Simulate the algorithm on following Text and Pattern

J I M _ S A W _ M E _ I N _ A _ B A R B E R S H O P : as Text

BARBER : as Pattern 10M

3B. Write an algorithm for following using transfer and conquer technique.

i. Uniqueness in an array

ii. Computing a mode 4M

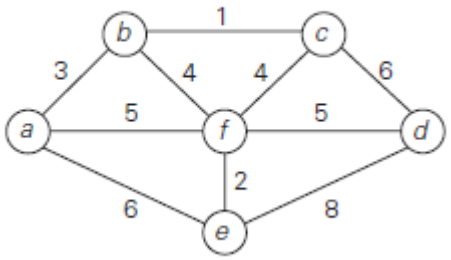
3C. Explain distribution counting method to sort for the following array. 6M

13	11	12	13	12	12

Give frequency table and Distribution values, Show the pseudo code to sort the same.

4A. List some important properties of heaps, Give algorithm for bottom-Up_Heap construction 10M

4B. Apply Kruskal's algorithm to the following graph. Show step-by-step solution to get the minimal spanning tree for the graph given below.



10M

5A. Explain the dynamic programming algorithm to compute the binomial coefficient. Hence compute $^5C_3$ using the same algorithm 10M

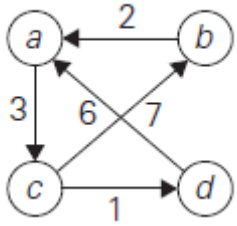
5B. Explain 2-3 tree and hence construct 2-3 tree for following elements.
9, 5, 8, 3, 2, 4, 7. Give its time efficiencies in inserting, deleting and searching. 10M

6A. How searching problem can be solved using Transfer and Conquer 4M

6B. Write an algorithm to check for uniqueness of the element using transform and conquer technique. Analyze the time complexity of the entire algorithm 6M

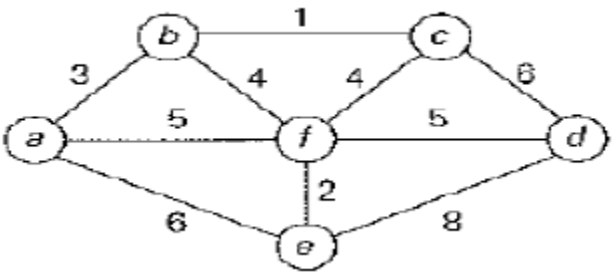
6C. Explain two versions of hashing for the following list of words.
A, FOOL, AND, HIS, MONEY, ARE, SOON, PARTED
with h(K) = sum of K's letters' positions in the alphabet MOD 13
10M

7A. Write a Floyd's algorithm to compute all pairs of shortest path of a graph.
Hence find the transitive closure of following graph. 8M



7B. Wite a note on various Asymptotic Notations .Explain with example 6M

7C. Write Dijkstra's Algortihm and apply the algorithm for following graph 6M



8A. Write a note on cook's theorem 6M

8B. What do you mean by variable length encoding ? Using Huffman tree find encoding codeword for CABAB and DADA. Decode 011110011 from hufman tree. Assume Symbols are **A, B,C, D** and _ and its frequencies are 0.35, 0.1, 0.2, 0.2 and 0.15 respectively for **A.B,C,D , _**

10M

8C. Write a note on exhaustive search . Give travelling salesman problem for following graph. Find optimal solution. 4M