(Please write your Exam Roll No.) *Exam Roll No. ……..*

END TERM EXAMINATION

FOURTH SEMESTER [MCA] JUNE – 2013

Paper Code: MCA-202 ***Subject: Analysis and Design of Algorithm***

Time: 3 Hours ***Maximum Marks: 60***

Note: Q.1 is compulsory. Attempt one question from each unit.

Question 1 Write short note on the following (any 10) (2*10)

Your answer should not have more than 10 lines and if need be only one figure:

i. Medium order statistics
ii. Hash Table
iii. Knapsack problem
iv. Matriods
v. Cooks theorem
vi. Worst case of quick sort
vii. AVL trees
viii. Bellman ford algorithms
ix. Huffman trees
x. Network flow
xi. Approximation algorithm
xii. Divide and conquer programming paradigm
xiii. Branch and bound paradigm

UNIT-1

Q2 Marks 3+3+4

(a) Solve the following recurrence relation using recursive tree
$T(n)=T(n-a)+T(a)+cn$ where $a>=1$ and $c>0$ are constants

(b) Using master theorem find the asymptotic bound for the following recurrence relation:
$T(n)=2\ T(n/2)+n^3$

(c) Arrange the following growth rates in increasing order and justify your answer:
$O(n^4), O(1), O(n^3), O(n\log n), O(n^2 \log n), \Omega(n^2 \log n), \emptyset(n\log n), \emptyset(n^2), \emptyset(n^{1.5}), \Omega(n!)$

Question 3 Marks 5+5

(a) Define big Oh notation in brief with the help of graphs.

(b) The following recurrence relation define running time of an algorithm A:

$$T(n) = 7\ T(n/2)+n^2$$

Competing algorithm A' has running time as follows:

$$T'(n) = a\ T'(n/4)+n^4$$

What is the largest integer value for 'a' such that A' is asymptotically faster than A.

UNIT-2

Question 4 Marks 5+5

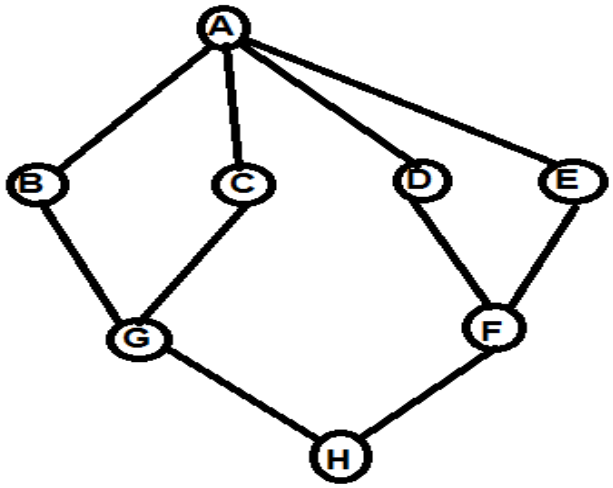
(a) Compare performance heap sort with merge sort and quick sort.

(b) Sort the following array using Heap-Sort technique.

<5,8,3,9,2,10,1,45,32>

Question 5 Marks 5+5

(a) Discuss algorithm of BFS and DFS and differentiate between them. Generate BFS and DFS for the following graphs while considering node A as a starting node.



(b) How many time FIND–SET and UNION called during the execution of CONNECTED COMPONENT on an undirected graph G= (V, E) with K connected component.

UNIT-3

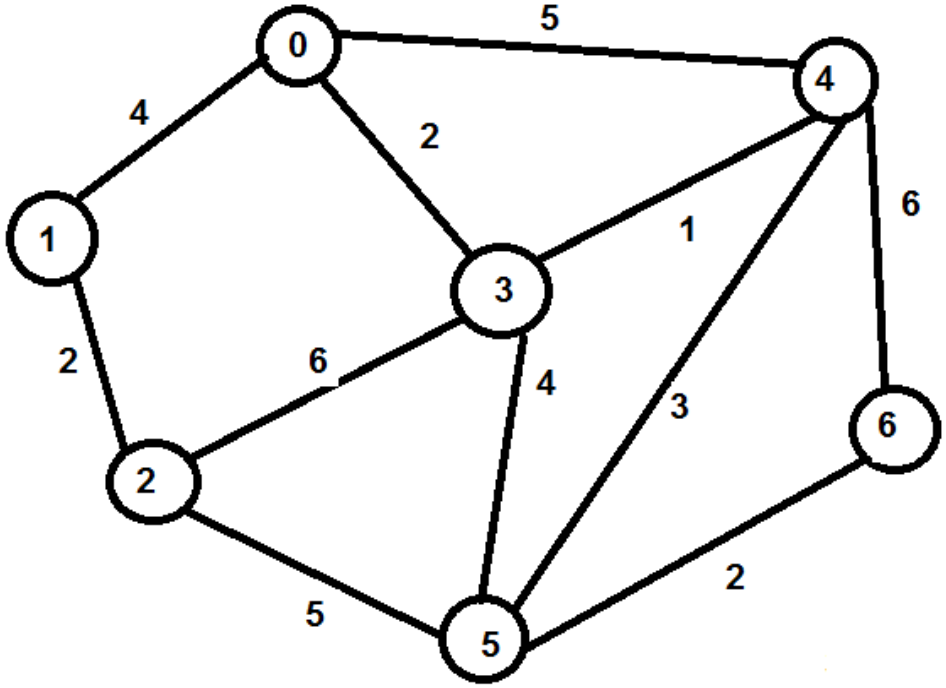
Question 6 Marks 5+5

(a) Differentiate between dynamic programming paradigm and greedy programming paradigm with examples.

(b) Find the optimal paranthesization of a matrix chain product whose sequence of dimension is as follows:
5*10 10*3 3*12 12*5 5*50 50*6

Question 7 Marks 5+5

(a)Find MST for the following graph using any one technique. Calculate final cost of generated MST. Also give an algorithm for the same.



(b)Draw a state transition diagram for a string-matching automation for the following pattern:

a b a b b a b b a c over the alphabet $\sum = \{a,b\}$.

UNIT-4

Question 8 Marks 5+5

(a) Differentiate between P, NP, NP hard and NPC problem.
(b) What do you understand by the term "reducibility"? Explain with example.

Question 9 Marks 5+5

(a)Show the circuit satisfiability problem is NPC problem. Use diagram to justify your proof.

(b) Currently what are the various techniques used while dealing with NPC problem? Are they optimal? Differentiate between decision problem and optimization problem.

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