Code No. 2354 / N

FACULTY OF ENGINEERING

B.E. 3/4 (CSE) I-Semester (New)(Main) Examination, November / December 2012

Subject : Design and Analysis of Algorithms

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

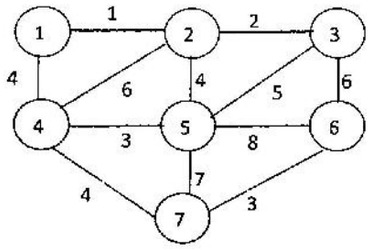
PART – A (25 Marks)

1. Show the following: (3)
   (a) $10n^2 + 9 \neq O(n)$ (b) $n^3 + 10n^2 = \Theta(n^3)$
2. Solve the recurrence: $T(n) = 6T(n/3)+n^2 \log n$ (3)
3. Write the control abstraction for Greedy approach. (2)
4. What is principle of Optimality? (2)
5. Explain traveling salesperson problem. (3)
6. What is meant by Satisfiability? (2)
7. What is Hamiltonian cycle? (2)
8. What is DFS and list its applications? (2)
9. Define the properties of LC-Search. (3)
10. Find an optimal binary merge pattern for files whose lengths number of records are 2, 5, 7, 9, 12, 13, 15 (3)

PART – B (5x10=50 Marks)

11.(a) What are the collision resolution policies in hashing? Write an algorithm for hashing with linear probing. (5)
   (b) Sort the following numbers 3, 16, 12, 14, 11, 15 using Heap sort. Show the step by step procedure. (5)

12.(a) Write a recursive algorithm for finding both the minimum and maximum elements in an array A of n elements. What is the running time? (5)
   (b) Define spanning tree and explain Kruskal's algorithm for finding Minimum Spanning Tree of the graph using the graph given below and write its time complexity. (5)



13. Write recurrence relations for solving OBST using dynamic programming and construct the tree for given data: (10)
   n=4, (a_1, a_2, a_3, a_4) = (end, goto, print, stop)
   p(1:4)=(1/20, 1/5, 1/10, 1/20) q(0:4)=(1/5, 1/10, 1/5,1/20, 1/20)
   Where Ps are probability of successful search and qs are probability of unsuccessful search.

14.(a) Write an algorithm for n Queens using backtracking approach. (7)
   (b) Explain FIFO Branch and Bound. (3)

15.(a) Explain what are NP-Hard and NP-Complete problems. (5)
   (b) Explain node cover decision problem. (5)

16.(a) Write an algorithm for in place partitioning of elements, taking first element of an array as pivot element. (5)
   (b) Find an optimal solution to 0/1 knapsack when (5)
   (w_1, w_2, w_3, w_4)=(10, 15, 6, 9)
   (p_1, p_2, p_3, p_4) = (2, 5, 8, 1)
   Knapsack capacity = 25 where Wi's are weights and Pi's are profits.

17. Write a short note on : (5+5)
   (a) Optimal storage on tapes (b) Multistage graphs

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Code No. 6112

FACULTY OF ENGINEERING

B.E. 3/4 (CSE) I – Semester (Main) Examination, November 2013

Subject : Design and Analysis of Algorithms

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

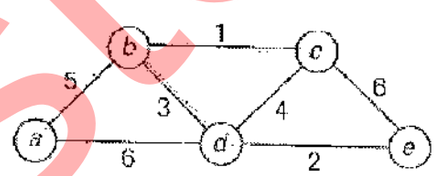
1. Write the control abstraction for Divide and Conquer technique. (2)
2. Solve : $T(n) = 3T\left(\frac{n}{3}\right) + \sqrt{n}$. (3)
3. Explain set representation and write algorithm for 'FIND'. (3)
4. What is Hamiltonian cycle? How is it different from the tour of travelling salesperson problem? (2)
5. Explain optimal merge pattern with an example. (3)
6. Differentiate between Greedy and Dynamic programming approaches. (2)
7. Explain graph coloring problem. (3)
8. What is meant by lower bound theory. (2)
9. Solve the fractional knapsack problem by considering the instance : Weights are, W : {1, 3, 5, 6, 7} , Profits, P : {3, 9, 7, 11, 18}. The knapsack capacity is 15. (3)
10. Explain what are explicit and implicit constraints of 8-Queens problem. (2)

PART – B (50 Marks)

11.a) Draw the 11 entry hash table for hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20 using the function (2i+5) mod 11, using linear probing. (5)

b) Write an algorithm to form a heap using 'Heapify' and discuss about its time complexity. (5)

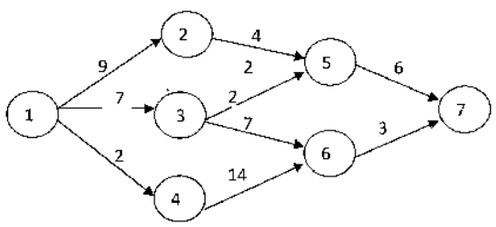
12.a) Define spanning tree and explain Prim's algorithm for finding minimum spanning tree of the graph using the graph given below (5)



(5)

b) Write an algorithm for merge sort and write the time complexities. (5)

13. What is Multistage graph? Find the shortest path in the graph given below dynamic programming. (10)



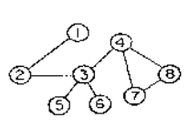
14.a) Explain solution of graph coloring problem using backtracking. (5)

b) What is Branch and bound strategy? Explain. (5)

15.a) State Cook's theorem. Explain its significance in NP-complete theory. (5)

b) Discuss NP-Hard code generation problems. (5)

16. Define biconnected component of a graph. Identify articulation point and draw biconnercted components of. (10)



17. Write short notes on :
    a) Reliability Design (5)
    b) Job scheduling with deadlines using Greedy approach (5)

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Code No. 6112 / S

FACULTY OF ENGINEERING

B.E. 3/4 (CSE) I – Semester (Supplementary) Examination, July 2014

Subject : Design and Analysis of Algorithms

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	Present an algorithm that searches an unsorted array a[1 : n] for the element 'x'. If 'x' occurs, then returns a position in the array, else return zero?	3
2	State the weighting, collapsing rules in sets.	2
3	Briefly differentiate quick sort and merge sort.	2
4	Define the terms Feasible solution, optimal solution and objective function.	3
5	State the purging rule and list out its applications.	2
6	Draw a five-stage graph.	3
7	What is the objective of m-colorability optimization problem?	2
8	Differentiate FIFO, LIFO branch-and-bound.	3
9	Define the terms cliques, node cover.	2
10	What are NP-Hard code generation problems?	3

PART – B (5 x 10 = 50 Marks)

11 a) Explain back tracking. Give the various applications of backtracking.
b) Solve the 8-Queen's problem using backtracking.

12 Briefly explain the terms
a) Non-determinstic algorithms b) Satisfiability problem c) Reducibility

13 Solve the 0/1 knapsack instance where
n = 3, $(w_1, w_2, w_3) = (2, 3, 4)$, $(p_1, p_2, p_3) = (1, 2, 5)$ and 6 using Dynamic programming.

14 a) Present an algorithm 'select' that finds the k^{th} smallest element in an array a[1:n].
b) Briefly explain spanning trees and their applications.

15 Present the heap sort algorithm. Explain and analyze its time complexity.

16 What are comparision trees? Explain their applications in searching and sorting problems?

17 Solve the all-pairs shortest path problem for a diagraph with the following weight matrix?

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 4 & 11 \\ 6 & 0 & 2 \\ 3 & \infty & 0 \end{bmatrix} \end{array}$$

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