Exam.Code:0916
Sub. Code: 6781

1018

B.E. (Computer Science and Technology)
Fourth Semester
CS-401: Analysis and Design of Algorithms

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) What can be the complexity of an algorithm if the time equation is 3 * log(n)+ log(log n)?

b) What is dynamic programming?

c) What is spanning tree?

d) State N-Queens problem.

e) What are NP-Complete and NP-hard classes? (5x2)

UNIT – I

II. Design an algorithm to find the maximum and minimum number from a set of numbers by using divide and conquer technique. (10)

III. a) Explain any algorithm to find out minimum spanning tree.

b) Illustrate Quick Sort algorithm on the following array: A = {10, 5,*1*, 9, 25, 6}. (2x5)

IV. a) Compare the Performance, Limitations and Advantages of Merge Sort and Quick Sort.

b) Find an optimal solution to the knapsack instance: n=7, m=15

(p1, p2, p3, p4, p5, p6, p7) = (10, 5, 15, 7, 6, 18, 3) and

(wl, w2, w3, w4, w5, w6, w7) = (2, 3, 5, 7, 1, 4, 1) (2x5)

UNIT – II

V. a) What are the polynomial time approximation schemes?

b) What multistage graph problem? How it can be solved? (2x5)

VI. Write and explain Graph Coloring algorithm with an example. (10)

VII. Explain the algorithm to solve all pair shortest path problem. (10)

x-x-x

5th Sem.

Roll No

Exam.Code:916
Sub. Code: 6805

1055

B.E./BEMBA (Computer Science and Engineering) Fourth Semester
CSE-411: Analysis and Design of Algorithm

Time allowed: 3 Hours

Max. Marks: 50

NOTE *Attempt five questions in all, including Question No. I which is compulsory and selecting atleast two questions from each part.*

x-x-x

1. Answer the following:
   a) Define Randomized Algorithms.
   b) Arrange the functions below from lowest asymptotic order to highest asymptotic order: 2^n, n^2, n^3, n log n, n^2+log n
   c) Given 2 sorted list of size 'm' and 'n' respectively. Determine the number of comparisons needed in the worst case by the merge sort algorithm.
   d) Differentiate between Greedy algorithm and Dynamic programming.
   e) What is multistage graph problem?
   f) What do you mean by overlapping subproblems.
   g) Explain Backtracking.
   h) Define polynomial – time algorithm.
   i) What is reduction?
   j) What is chromatic number of the graph?

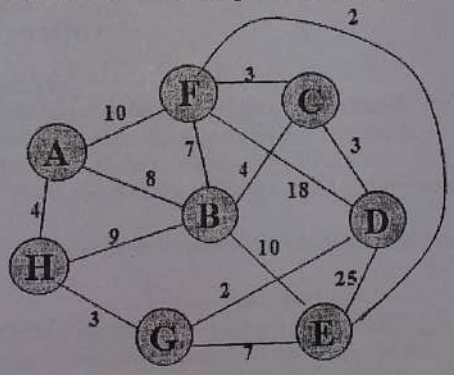
(10x1=10)

Part A:

2. a) Instead of partitioning into two equal parts in binary search, if we partition the list into two lists, one having one third of the total elements and other having remaining elements. On considering this modified binary search algorithm answer the following:
      i) Write down the recurrence relation for the worst case of the algorithm.
      ii) Solve the recurrence relation using recursion tree method.
      iii) Solve the recurrence relation obtained in (i) using Master's theorem.
   b) Determine the recurrence relation for the worst case of quick sort algorithm and solve the same.

(06+04)

3. a) Generate minimum spanning tree for the following graph using Prim's algorithm. Show all the intermediate results. Also write the algorithm to solve the same along with its complexity.



   b) Consider the following instance of the knapsack problem: n=3, W=50, (p_1, p_2, p_3) = (60, 100, 120) and weight (w_1, w_2, w_3) = (10, 20, 30). Find the optimal solution. Write the algorithm to solve the same using greedy approach also analyze its complexity.

(05+05)

4. a) Given 10 activities along with their start and finish time as
   $S = (A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10})$
   S_i = (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
   f_i = (5, 3, 4, 6, 7, 8, 11, 10, 12, 13)
   Find the schedule where the largest number of activities takes place using greedy approach. Give its algorithm and analyze its complexity.
   b) Solve the recurrence using master theorem $T(n) = 7T(n/3) + n^2$.

(06+04)

P.T.O.

(05+05) (iii),

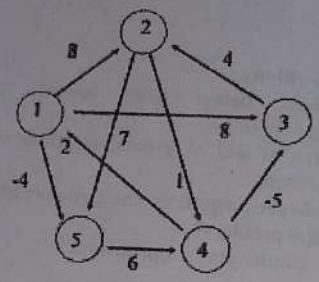
P.T.O.

x-x-x

Part B:

5. a) Distinguish between NP - hard, NP- complete problems. Give examples for each of the problem.
   b) Determine the longest common subsequence of 'TECHNOLOGY' and 'INFOTECH' using Dynamic pro... approach. Write its algorithm for printing the sequence. (04+0...

6. a) Find the shortest path between all pairs of vertices in the following graph using Dynamic programming approach. Write its algorithm and drive its complexity.



b) In assembly-line scheduling problem show how to modify the print-stations procedure to print out the stations in increasing order of station number.

a) Give a backtracking solution for the 8x8 chess board, 8-Queen's problem. (06+04)
b) Design an algorithm for the n- coloring problem considering backtracking technique. (06+04)

-X-X--x--

May - 2016

Exam.Code:0916
Sub. Code: 6806

1056

B.E. (Computer Science and Engineering)
Fourth Semester
CSE-401: Analysis and Design of Algorithms

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting atleast two questions from each Section.*

x-x-x

1. Answer the following:
   a) Describe various characteristics of algorithm.
   b) Define the asymptotic notation "Theta" (θ).
   c) Determine the number of comparisons required for sorting two sorted list of size m and n respectively in Average case by merge sort algorithm.
   d) Differentiate between Greedy algorithm and Dynamic programming.
   e) Discuss multistage graph problem?
   f) What is chromatic number?
   g) Discuss backtracking technique.
   h) Define polynomial time algorithms?
   i) State graph coloring problem.
   j) Discuss assembly-line scheduling problem.

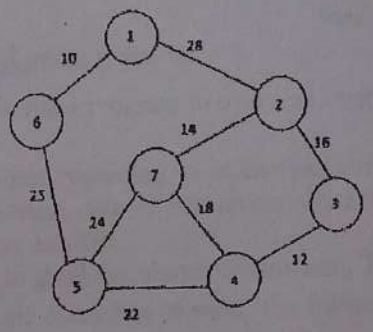
(10x1=10)

Section A:

2. a) Design an algorithm to find the largest number from a given sequence of numbers and analyze its time complexity.
   b) Write a ternary search algorithm that first test the element at position n/3 for equality with value of x, and then checks the element at 2n/3 and either discovers x or reduces the set to one-third the size of original. Give the recurrence relation for the worst case of the algorithm and solve the same using any method.

(03+07)

3. a) Solve the recurrence $T(n) = 4T(n/2) + n2\sqrt{n}$.
   b) Apply Prim's algorithm to find Minimum spanning tree for the following graph. Show all the intermediate results. Write the algorithm to solve the same along with its time complexity.



(04+06)

4. a) Consider the following instance of the knapsack problem:
$n=4, W=5, (p_1,p_2,p_3,p_4)=(12,10,20,15)$ and weight $(w_1,w_2,w_3,w_4)=(2,1,3,2)$
Find the optimal solution. Write the algorithm to solve the same using greedy approach also analyze its complexity.

P.T.O.

...ey are traversed in (ii), (iii),
(05+05)
P.T.O.

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x-x-x

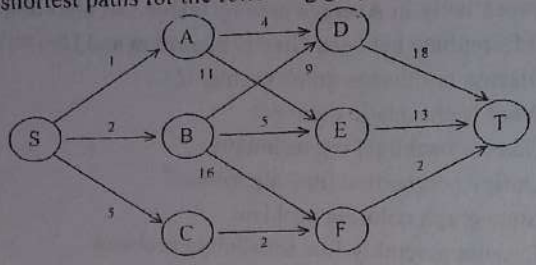
b) Let 11activities are given S = (A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11}) along with their start and finish time as (1, 4), (3, 5), (0, 6), (5, 7), (3, 8), (5, 9), (6, 10), (8, 11), (8, 12), (2, 13) and (12, 14). Find the schedule where the largest number of activities takes place using greedy approach. Give its algorithm and analyze its complexity. (05+05)

Section B:

5. a) What are NP - hard, NP- complete problems. Give examples of five problems that can be classified as NP problems.

b) Determine the longest common subsequence of 'TECHNOLOGY' and 'TECHNOCRATS' using Dynamic programming approach. Write its algorithm for printing the sequence. (04+06)

6. a) Find all pairs shortest paths for the following graph. Write its algorithm and drive its complexity.



b) Consider the following matrices and its dimensions

Matrix	Dimensions
A_1	5x4
A_2	4x6
A_3	6x2
A_4	2x7

Find the order of Parenthesization for the optimal chain multiplication. Also write the algorithm for printing process.

(05+05)

7. a) Discuss 0/1 knapsack problem using backtracking.

b) Discuss backtracking solution for 8-queen's problem by explaining all the data structures used.

(05+05)

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Exam.Code:916
Sub. Code: 6805

1015

B.E./B.E. MBA (Computer Science and Engineering) Fourth Semester

CSE-411: Analysis and Design of Algorithms

Time allowed: 3 Hours

Max. Marks: 50

***NOTE**: Attempt five questions in all, selecting at least two questions from each unit.*

x-x-x

UNIT – I

I. a) Consider the modified binary search algorithm so that it splits the input not into two sets of almost equal sizes, but into three sets of sizes approximately one-third. Write down the recurrence for this ternary search algorithm. Solve the recurrence using recursion tree method. Also solve the recurrence using master's theorem and iterative method.

b) Which is asymptotically larger log (log*n) or log*(log n) (8,2)

II. a) Determine mathematically Worst-Case complexity of quick sort algorithm.

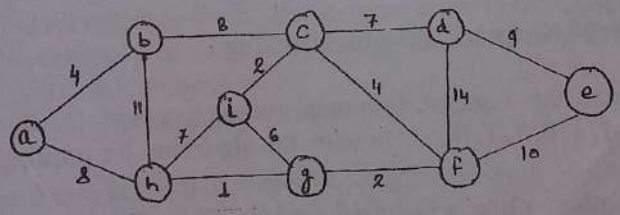
b) Solve the following recurrence using master's theorem:

$$T(n) = 7T\left(\frac{n}{3}\right) + n^2$$ (6,4)

III. a) Consider the following instance of the Knapsack problem: n=3, W=50, (p_1, p_2, p_3) = (60, 100, 120) and weight (w_1, w_2, w_3) = (10, 20, 30). Find the optional solution. Also write the algorithm to solve the same.

b) Write a greedy algorithm for finding single source shortest path and find out its complexity. (6,4)

IV. a) Explain principle of optimality. Apply Prim's algorithm for finding minimum spanning tree for the graph given below:-



Show all intermediate results.

b) Discuss activity selection problem and give its solution. (6,4)

P.T.O.

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..., and the order they are traversed in (ii), (iii)

...perties

UNIT – II

V. a) Consider the following matrix and its dimensions:

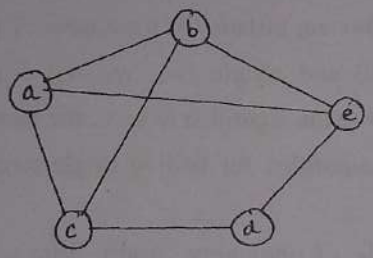
Matrix	Dimensions
A_1	5 x 4
A_2	4 x 6
A_3	6 x 2
A_4	2 x 7

Find the order of parenthesization for the optimal chain multiplication. Also write the algorithm for printing process.

b) Explain the multistage graph problem with an example. (6,4)

VI. a) What is Backtracking? Give a backtracking solution for 8-Queen's problem by explaining all the data structures used.

b) Give a backtracking solution for graph coloring problem. Trace the given algorithm for the following graph:



(5,5)

VII. a) Distinguish between P,NP and NP-complete problems. Give examples for each category.

b) Discuss O/I Knapsack using backtracking. (5,5)

VIII. a) Determine the Longest Common subsequence of (1, 0, 0, 1, 0, 1, 0, 1) and (0, 1, 0, 1, 1, 0, 1, 1, 0) . Also write the algorithm for printing.

b) In assembly – line scheduling problem show how to modify the print stations procedure to print out the stations in increasing order of station number. (6,4)

x-x-x