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13MCA41

Fourth Semester MCA Degree Examination, June/July 2018
Analysis & Design of Algorithms

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain worst case, best case and average case efficiencies. **(06 Marks)**

b. Solve the following recurrence relation,

$A(n) = A(\lfloor n/2 \rfloor) + 1$ for $n > 1$ by taking initial condition as $A(1) = 0$ and $n = 2^K$ **(04 Marks)**

c. Write algorithms for bubble sort and selection sort and give time complexities for both. **(10 Marks)**

2 a. Discuss algorithm design and analysis process. **(04 Marks)**

b. Explain asymptotic notations. **(06 Marks)**

c. Analysis time complexity of matrix multiplication. **(06 Marks)**

d. Define the following terms:

(i) Weighted graph
(ii) Connected graph.
(iii) Ordered tree
(iv) Dictionary **(04 Marks)**

3 a. Illustrate how divide and conquer is applied using quicksort to the following numbers for sorting:

65 70 75 80 85 60 55 50 45 **(08 Marks)**

b. Explain time complexity of Mergesort. **(06 Marks)**

c. Analysis time complexity of stressen's matrix multiplication. **(06 Marks)**

4 a. Explain general strategies applied in decrease and conquer technique. **(04 Marks)**

b. Write algorithm for Depth-First search. **(06 Marks)**

c. Illustrate source-removal algorithm for topological sorting problem. **(06 Marks)**

d. Write differences between DFS and BFS. **(04 Marks)**

5 a. Explain about input enhancement. **(04 Marks)**

b. Write Harspool's string matching algorithm. Apply this to find the pattern "BARBER" in the text "JIM-SAW ME-IN-A BARBER SHOP". **(12 Marks)**

c. Discuss about various types of hashing. **(04 Marks)**

6 a. Apply dynamic programming technique for the below knapsack problem and find the optimal value of the knapsack.

n = 4 (no. of items) W(capacity) = 5 **(10 Marks)**

Item	1	2	3	4
Weight	2	1	3	2
Profit	12	10	20	15

b. Write Floyd's algorithm. **(05 Marks)**

c. Write an algorithm for computing the binomial coefficient C(n, K) using dynamic programming. **(05 Marks)**

7 a. Write Prim algorithm and apply the same to find minimum cost spanning tree for the following graph. **(10 Marks)**

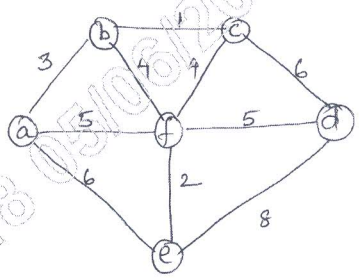

Fig. Q7 (a)

b. Apply Dijkstra algorithm to the following graph: **(05 Marks)**

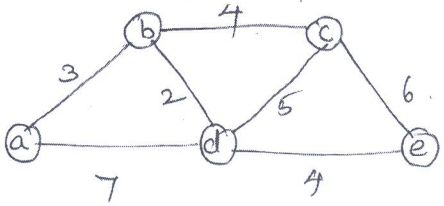

Fig. Q7 (b)

c. Apply Branch-bound technique for knapsack problem by taking following values:
n = 4, m = 10 (weight of knapsack)
$(P_1, P_2, P_3, P_4) = (40,42,25,12)$
$(W_1, W_2, W_3, W_4) = (4,7,5,3)$ **(05 Marks)**

8 a. Draw Decision trees for 3 elements selection sort and binary search in a four element array. **(06 Marks)**

b. Write algorithm for Back tracking and draw state-space tree for four queen's problem using back tracking. **(08 Marks)**

c. Explain about P, NP and NP-complete. **(06 Marks)**

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