Total No. of Questions : 8]

SEAT No. :

PD4576

[Total No. of Pages : 3

[6404]-81
B.E.(Computer Engineering)
DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - VII) (410241)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Give a mathematical formulation for: **[8]**

i) Fractional Knapsack problem.

ii) 0/1 Knapsack problem.

b) Consider a set of seven activities. The start and finish time of these activities are given in the following table. **[9]**

Activity	Start time	Finish time
A	1	3
B	3	4
C	2	5
D	0	7
E	5	9
F	8	10
G	11	12

Use the greedy algorithmic strategy to compute an execution schedule having maximum number of non-conflicting activities.

OR

P.T.O.

Q2) a) With respect to dynamic programming, what is the principle of optimality? Give a mathematical representation for the same. **[7]**

b) Consider the 0/1 Knapsack problem with the total weight capacity of 7. The weights and associated values (profits) of 4 items are given below. Use dynamic programming approach to find the optimal solution to this problem. **[10]**

Item	Weight	Value(Profit)
A	1	1
B	3	4
C	4	5
D	5	7

Q3) a) Consider a graph, which is represented by the adjacency matrix given below: **[10]**

	A	B	C	D
A	0	1	1	0
B	1	0	0	1
C	1	0	0	1
D	0	1	1	0

We wish to colour this graph using Red and Black colours using a backtracking algorithm. Show the process of colouring it in stepwise manner using state space diagram.

b) Prove that the full state space tree of finding sum of subset of n elements using backtracking will have (excluding the leaf nodes)2^n-1 nodes. **[4]**

c) What are the major drawbacks of branch and bound method? **[4]**

OR

Q4) a) State the sum of subsets problem. Write an algorithm to solve this problem using backtracking method. Comment on the time complexity of this algorithm. **[8]**

b) Consider the three objects. The weights and associated values are given below.

	weight	value
O_1	5	6
O_2	4	5
O_3	3	4

Assume the Knapsack capacity m = 7. Solve this 0/1 Knapsack problem using LC branch and bound method. **[10]**

Q5) a) Give an amortized analysis of a k bit binary counter using aggregate method. **[6]**

b) What are tractable and non-tractable problems? Give examples. **[7]**

c) Does randomized algorithm for quick sort, improves the average case time complexity? **[4]**

OR

Q6) a) Explain with the help of example the methods of amortized analysis. **[6]**

b) What is an approximation algorithm? How does performance ratios useful in approximation algorithms? **[7]**

c) What are randomized algorithms? Enlist few reasons to use randomized algorithms. **[4]**

Q7) a) Write a simple multithreaded matrix multiplication algorithm based on parallelizing relevant loops of the conventional procedure. **[8]**

b) Explain in brief race condition in multithreaded algorithms. **[4]**

c) What do you understand by *spawn* and *sync* keywords used in multithreaded programming? **[6]**

OR

Q8) a) Write distributed breadth search algorithm. What is its advantage over the conventional approach? **[8]**

b) Write a Rabin-Karp string matching algorithm. Input to the algorithm be: Original text "t" of length n and pattern text being matched is "p" of length m. What is the expected runtime and worst-case runtime of this algorithm? **[10]**

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