Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

CA5EL05 Design and Analysis of Algorithms

Programme: MCA Branch/Specialisation: Computer Application

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which algorithm is faster **1**

(a) $O(n^2)$ (b) O(nlogn) (c) O(n) (d) $O(n^3)$

ii. Time Complexity of BFS using adjacency matrix **1**

(a) $O(n^2)$ (b) O(nlogn) (c) O(n) (d) $O(n^3)$

iii. Finding the location of the element with a given value is **1**

(a) Traversal (b) Search (c) Sort (d) None of these

iv. Quick sort has steps **1**

(a) Divide (b) Conquer

(c) Divide and Conquer (d) Divide, Conquer and Combine

v. Principle of optimality holds in **1**

(a) Dynamic Programming (b) Greedy method

(c) Divide and conquer (d) None of these

vi. Time complexity of Matrix Chain Multiplication is **1**

(a) O(n) (b) O(nlogn) (c) $O(n^2)$ (d) $O(n^3)$

vii. Backtracking is **1**

(a) BFS with the bounding function

(b) DFS with the bounding function

(c) D-Search with the bounding function

(d) None of these

viii. Branch and bound applied on **1**

(a) Minimization problems

(b) Maximization problems

(c) Minimization & maximization problems

(d) None of these

P.T.O.

	ix.	Is it necessary that NP-Complete problems can always solved by non-deterministic algorithm in polynomial time? (a) Yes (b) No (c) Sometimes (d) Can't say	**1**
	x.	NP-Complete is intersection of (a) P and NP (b) NP and NP Hard (c) P and NP Hard (d) None of these	**1**
Q.2	i.	Prove that $6*2^n + n^2 = O(2^n)$.	**2**
	ii.	Find the complexity of matrix addition using tabular method.	**3**
	iii.	Explain all asymptotic notations.	**5**
OR	iv.	Write DFS algorithm. Give one example of finding DFS from a graph.	**5**
Q.3		Attempt any two:	
	i.	Solve the following fractional knapsack problem using greedy method n = 3, m = 20, (p1, p2, p3) = (25,24,15) and (w1, w2, w3) = (18, 15, 10)	**5**
	ii.	Sort the array using quick sort : 10 , 90 , 30 , 60 , 40, 25 , 20	**5**
	iii.	Sort the array using merge sort 2, 18, 6, 32, 82, 40, 45, 42	**5**
Q.4	i.	Write Bellman – Ford algorithm.	**3**
	ii.	Solve the following using matrix chain multiplication: A(20*2) , B(2*15) , C(15*40) , D(40*4)	**7**
OR	iii.	Find the longest common subsequence from X and Y X=(H,U,M,A,N) Y=(C,H,I,M,P,A,N,Z,E,E)	**7**
Q.5	i.	Write algorithm for N - Queen problem	**3**
	ii.	Solve the 0/1 knapsack problem using FIFO branch & bound n=4, m=15, (p1, p2, p3, p4) = (10,10,12,18), (w1, w2, w3, w4) = (2,4,6,9)	**7**
OR	iii.	If the adjacency matrix is as follow, obtain the state space tree of travelling salesperson problem using LC branch and bound method.	**7**

∞	5	9	8	7
8	∞	10	6	14
12	9	∞	14	11
13	4	6	∞	3
4	7	13	9	∞

Source vertex is 1

Q.6		Attempt any two:	
	i.	Explain P, NP, NP-Complete and NP-Hard problem.	**5**
	ii.	Write a note on algebraic and set algorithms.	**5**
	iii.	Apply Boyer's Moore algorithm to search a given pattern. Text: analysis of algorithm Pattern: rithm	**5**

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Marking Scheme

CA5EL05 Design and Analysis of Algorithms

Q.1	i.	Which algorithm is faster (c) O(n)	**1**
	ii.	Time Complexity of BFS using adjacency matrix (a) $O(n^2)$	**1**
	iii.	Finding the location of the element with a given value is (b) Search	**1**
	iv.	Quick sort has steps (c) Divide and Conquer	**1**
	v.	Principle of optimality holds in (a) Dynamic Programming	**1**
	vi.	Time complexity of Matrix Chain Multiplication is (d) $O(n^3)$	**1**
	vii.	Backtracking is (b) DFS with the bounding function	**1**
	viii.	Branch and bound applied on (a) Minimization problems	**1**
	ix.	Is it necessary that NP-Complete problems can always solved by non-deterministic algorithm in polynomial time? (a) Yes	**1**
	x.	NP-Complete is intersection of (b) NP and NP Hard	**1**
Q.2	i.	Prove that $6*2^n + n^2 = O(2^n)$.	**2**
		Right value of c	1 mark
		Right value of n	1 mark
	ii.	Find the complexity of matrix addition using tabular method.	**3**
		First for loop with step count	1 mark
		Second for loop with step count	1 mark
		Matrix addition step with step count	1 mark
	iii.	All asymptotic notations.	**5**
		5 notations 1 mark for each	(1 mark * 5)
OR	iv.	DFS algorithm	2.5 marks **5**
		Example	2.5 marks
Q.3		Attempt any two:	
	i.	Fractional knapsack problem using greedy method	**5**
		3 greedy methods 1 mark for each (1 mark * 3)	
		Solution Set	1 mark
		Profit	1 mark
	ii.	Sort the array using quick sort	**5**
		Movement of i and j	1 mark
		Partition into two subarrays	1 mark
		Solving subarrays	3 marks
	iii.	Sort the array using merge sort	**5**
		Divide array into subarrays	2.5 marks
		Combine	2.5 marks
Q.4	i.	Write Bellman – Ford algorithm.	**3**
		Six steps 0.5 mark for each step	(0.5 mark * 6)
	ii.	Solve the following using matrix chain multiplication:	**7**
		Finding values of m	5 marks
		Put parenthesis	2 marks
OR	iii.	Find the longest common subsequence from X and Y	**7**
		Table	5 marks
		Subsequence from table	2 marks
Q.5	i.	Write algorithm for N - Queen problem	**3**
		Two algorithms 1.5 marks for each	(1.5 mark * 2)
	ii.	Solve the 0/1 knapsack problem using FIFO branch & bound	**7**
		Tree For FIFO branch and bound	
OR	iii.	LC branch and bound method.	**7**
		Reduced cost matrices	3.5 marks
		State space tree generated by LCBB	3.5 marks
Q.6		Attempt any two:	
	i.	Explain P, NP, NP-Complete and NP-Hard problem.	**5**
		P problem	1 mark
		NP problem	1 mark
		NP-Complete problem	1 mark
		NP Hard Problem	2 marks
	ii.	Write a note on algebraic and set algorithms.	**5**
		algebraic algorithm	2.5 marks
		set algorithm	2.5 marks
	iii.	Apply Boyer's Moore algorithm to search a given pattern.	**5**
		Searching of rithm until end of text	5 marks

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