Hall Ticket Number:

Code No. : 14642 AS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T.) IV-Semester Advanced Supplementary Examinations, September-2022

Design and Analysis of Algorithms

(IT Only)

Time: **3 hours** Max. Marks: **60**

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

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Which of the asymptotic notations are not reflexive?	2	1	1	1
2.	Show $T(n)$ in O-notation, where $T(n) = 4T\left(\frac{n}{2}\right) + n$?	2	2	1	1
3.	What are the average and worst-case time complexities of Quick sort?	2	1	2	1
4.	Define Master Theorem?	2	1	2	1
5.	What is the time complexity of Bellman-Ford algorithm for shortest path tree algorithm using adjacency matrix and adjacency list representations respectively?	2	1	3	1
6.	Define the reliability design problem?	2	1	3	1
7.	Describe graph coloring problem?	2	1	4	1
8.	Show an instance of Travelling Salesman Problem?	2	2	4	2
9.	Define Cook's Theorem of NP-Completeness?	2	1	5	1
10.	Show any one problem which is NP-Hard but not NP-Complete?	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Organize these functions according to their growth, from slowest growing to fastest growing. $f_1(n) = n^{\pi}$, $f_2(n) = \pi^n$, $f_3(n) = 1.1^n$, $f_4(n) = n \log n$, $f_5(n) = 2^{10}$, $f_6(n) = \binom{n}{4}$, $f_7(n) = n^2 \log n$, $f_8(n) = 2n$?	4	3	1	2
b)	Solve the recurrence relation $T(n) = \sqrt{n}\, T(\sqrt{n}) + n$.	4	3	1	2
12. a)	Demonstrate about greedy method to obtain a set of optimal Huffman codes?	4	2	2	2
b)	Develop the merge procedure to merge two successive sorted (non-decreasing order) sub lists of an array, If A[1..n] is the array, A[p .. q] and A[q+1 .. r] are two sorted sub lists, after merging the array elements A[p .. r] should be in sorted order?	4	3	2	2

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13. a)	Show the dynamic programming formulation of 0/1 knap sack problem?	4	2	3	1
b)	Construct the optimal parenthesizing of a matrix-chain product whose sequence is <5, 10, 3, 12, 5, 50, 6>?	4	3	3	2
14. a)	Demonstrate the general methodology of branch and bound technique of problem solving?	4	2	4	2
b)	List all solution of 5-queens problem in which one queen is placed in first column, second row?	4	3	4	2
15. a)	Show that clique decision problem is NP-Complete?	4	2	5	1
b)	Explain about any NP-Hard scheduling problem?	4	2	5	2
16. a)	Solve the recurrence relation $T(n) = T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + O(n)$, using recursive tree method?	4	3	1	2
b)	Consider the following jobs with associated profits and deadlines. Compute the sequence of jobs which will give maximum profit using greedy method	4	3	2	2

Jobs	J1	J2	J3	J4	J5	J6
Deadlines	2	3	3	1	4	2
Profit	200	180	160	150	140	130

17.	Answer any ***two*** of the following:				
a)	Construct the optimal binary search tree for the identifier set {cout, float, if, while}with p(1) = 1/20, p(2) = 1/5, p(3) = 1/10, p(4) = 1/20 and q(0) = 1/5, q(1) = 1/10, q(2) = 1/5, q(3) = 1/20 and q(4) = 1/20?	4	3	3	3
b)	Demonstrate about solving the Travelling Salesman Problem using branch and bound?	4	2	4	2
c)	Show that Node Cover decision problem is in NP?	4	2	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
Iii_	Blooms Taxonomy Level – 3 & 4	40%

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