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Code No. : 22957

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**M.Tech. (C.S.E.) II-Semester Main Examinations, September-2022**

**Advanced Algorithms**

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.	<p>Give the order of vertices in which they are visited when the following graph is traversed using DFS algorithm considering A as a source vertex.</p>	2	3	1	1,2,3
2.	Write a BFS algorithm.	2	1	1	1,2
3.	Explain the basic principle of a Greedy method of algorithm design technique.	2	3	2	1,2,3
4.	<p>Obtain all the maximal graph matching sets for the following graph.</p>	2	3	2	1,2,3
5.	<p>The matrix A is transformed to the matrix shown below by an algorithm which computes LU decomposition. Obtain the matrices L and U.</p> <p><b>Matrix A</b></p> $\begin{bmatrix} 2 & 3 & 1 & 5 \\ 6 & 13 & 5 & 19 \\ 2 & 19 & 10 & 23 \\ 4 & 10 & 11 & 31 \end{bmatrix} \rightarrow \begin{bmatrix} 2 & 3 & 1 & 5 \\ 3 & 4 & 2 & 4 \\ 1 & 4 & 1 & 2 \\ 2 & 1 & 7 & 3 \end{bmatrix}$	2	2	3	1,2,3

6.	<p>If the following graph is input with vertex s as source and the vertex t as sink, which augmenting path is selected by the Edmond's Karp algorithm in the first iteration?</p>	2	2	3	1,2
7.	<p>Transform the integer number 11 from base representation to modulo representation, if p1 is 3 and p2 is 4.</p>	2	3	4	1,2,3
8.	<p>Given <math>P_1=3, p_2=4, p_3=5</math>, what is the range of numbers in which each number has a unique modulo representation?</p>	2	3	4	1,2,3
9.	<p>Draw a Venn diagram showing the commonly believed relationship between P, NP, NP-Hard and NP-complete classes of problems. Which class of problems the sorting belongs to?</p>	2	3	5	1,2
10.	<p>Give two main types of randomized algorithms.</p>	2	1	5	1,2
<p><b>Part-B (5×8 = 40 Marks)</b></p>					
11. a)	<p>Explain, with the help of an example, topological sorting.</p>	4	1	1	1,2
b)	<p>Explain Merge sort algorithm.</p>	4	1	1	1,2
12. a)	<p>Explain how the augmenting paths are used to find a solution to maximum matching problem.</p>	4	2	2	1,2
b)	<p>Identify an augmenting path in the following graph and enhance the cardinality of the graph matching <math>M = \{ (2,7), (5,4) \}</math></p>	4	2	2	1,2,3
13. a)	<p>Obtain the time complexity of Strassen's matrix multiplication algorithm</p>	4	2	3	1,2
b)	<p>Explain Ford-Fulkerson method to compute maximum flow in a given graph.</p>	4	2	3	1,2

a)	Explain the basic principles of Dynamic Programming paradigm of algorithm design.	4	2	4	1,2
b)	State and prove Chinese Remainder Theorem.	4	3	4	1,2,3
15. a)	Plot the feasible region for the following set of linear constraints. $4x_1 - x_2 \leq 8$ $2x_1 + x_2 \leq 10$ $5x_1 - 2x_2 \geq -2$ $x_1, x_2 \geq 0$	4	3	5	1,2,3
b)	Explain Advanced Number Theoretic algorithm.	4	2	5	1,2
16. a)	Sort the following data using quick sort algorithm showing all the intermediate steps. 95,12,88,27,10,765,25,44,33,9	4	3	2	1,2
b)	Explain Edmond Blossom algorithm to compute augmenting path with an example.	4	2	2	1,2
17.	Answer any <i>two</i> of the following:				
a)	Explain the procedure of LUP decomposition.	4	2	3	1,2
b)	Design an algorithm with time complexity $O(n^2)$ for polynomial interpolation.	4	3	4	1,2,3
c)	Explain Approximation algorithms.	4	1	4	1,2

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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