MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PEC-IT601A Advanced Algorithms
UPID : 006589

Time Allotted : 3 Hours   *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :   [1 x 10 = 10]

    (I)   Which property does Matroids exhibit?

    (II)   If the number of equations is less than the number n of unknowns or the rank of A is less than n, then the system is _____ .

    (III)   Dynamic programming works with _____ subproblems.

    (IV)   An_____algorithm maximizes or minimizes a criterion function.

    (V)   _____analysis gives the average performance of each operation in worst case.

    (VI)   The complexity of BFS is _____

    (VII)   Which elimination can be used to find the triangular matrices ?

    (VIII) Which algorithm finds the shortest path between every pair of vertices ?

    (IX)   The problem X is said to be _____to another problem Y if there exist an algorithm A for Y and that algorithm can be used to solve X .

    (X)   In *mathematics*, _____is a process which combines two functions on a set to produce another function on the set.

    (XI) $F(n)=2^n +n^2$ is $\Theta($_____$)$.

    (XII)   Every alternating odd cycle must pass through at least one _____ edge.

Group-B (Short Answer Type Question)

Answer any three of the following :   [5 x 3 = 15]

2. State white path theorem and parenthesis theorem   [5]

3. What is alternating BFS tree? Classify the non- tree edges in alternating BFS tree. [5]

4. Write an algorithm to compute alternating BFS tree.   [5]

5. Use Gaussian elimination to find the upper and lower triangular matrices. [5]

$$\begin{bmatrix} 2 & 3 & 1 & 5 \\ 6 & 13 & 5 & 19 \\ 2 & 19 & 10 & 23 \\ 4 & 10 & 11 & 31 \end{bmatrix}$$

6. What is satisfiability problem? Show that the Satisfiability problem is NP. [5]

Group-C (Long Answer Type Question)

Answer any three of the following :   [15 x 3 = 45]

7. What do you mean by amortized analysis? Define the three methods of amortized analysis. Explain the [1+6+4+4 accounting method and potential method using the stack example.]

8.   What is matroid? Define the two properties of matroid. Write an greedy algorithm that works for any [2+4+5+4 matroid to find optimal subset and also analyse its complexity.]

9. Define weighted matroid. Define minimum spanning tree. Define optimal subset of matroid. How can an [MST problem be viewed/formulated as finding an optimal subset of matroid? Using the same find the 2+2+2+5+4 minimum spanning tree of the graph G.]

G
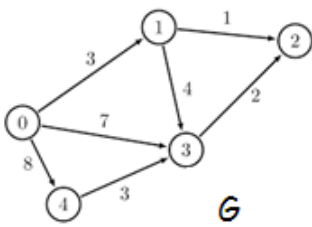
10. State min-cut max-flow theorem.Find the flow of the network using Edmond Karp algorithm.   [3+12]
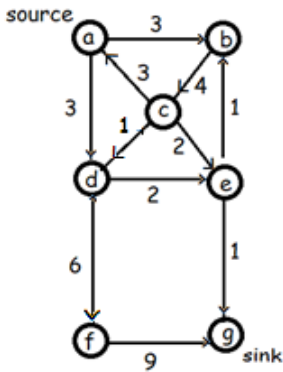
11. What do you mean by reduction and polynomial reduction?How can you reduce maximum independent [1+2+6+6
    set problem to clique decision problem?Reduce 3CNF problem to largest independent set problem.   ]

*** END OF PAPER ***