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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 Θ(_____) .

(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]

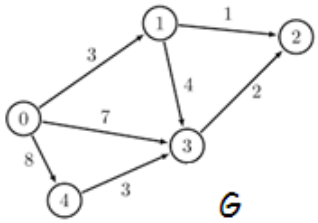
$$\begin{pmatrix} 2 & 3 & 1 & 5 \\ 6 & 13 & 5 & 19 \\ 2 & 19 & 10 & 23 \\ 4 & 10 & 11 & 31 \end{pmatrix}$$

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

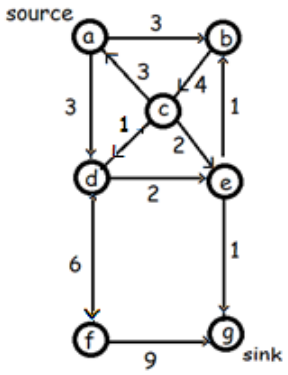
Group-C (Long Answer Type Question)

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 accounting method and potential method using the stack example. [1+6+4+4]
8. What is matroid? Define the two properties of matroid. Write an greedy algorithm that works for any matroid to find optimal subset and also analyse its complexity. [2+4+5+4]
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 minimum spanning tree of the graph G. [2+2+2+5+4]



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 set problem to clique decision problem?Reduce 3CNF problem to largest independent set problem. [1+2+6+6]

*** END OF PAPER ***