

Algorithm and Theory of Computation

[1a] Write the definitions of (1) *P*-Problem, (2) *NP*-problem, (3) *NP* – Complete Problem and (4) *Polynomial – Transformation*.

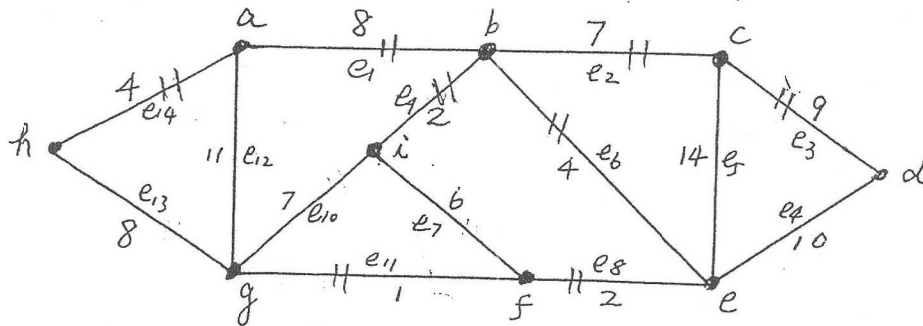
[1b] Given the set of clauses over a finite set $U = \{a, b, c\}$:

$$\{a + b, \bar{a} + \bar{b}, a + c, \bar{a} + \bar{c}, b + c, \bar{b} + \bar{c}\}.$$

Is there a satisfying truth assignment ?

[2] Solve the matrix chain product problem for the instance of $A_{14 \times 12}$, $B_{12 \times 2}$, $C_{2 \times 7}$, $D_{7 \times 8}$ matrices.

[3] Given a graph as follows:



find MST by Kruskal's algorithm. (20 Points)

[4] Suppose we have an instance of *TSP* given by the cost matrix:

	1	2	3	4	5	6
1	∞	3	5	8	1	2
2	3	∞	6	4	5	9
3	5	6	∞	2	4	1
4	8	4	2	∞	7	5
5	1	5	4	7	∞	6
6	2	9	1	5	6	∞

a) Give the partial solution $X = (5, 2, -, -, -)$, calculate $B(X)$ using the reducing technique on the matrix.

b) For X as in a), use backtracking with branch-and-bound to find the best solution which is an extension of the given partial solution. Draw the portion of the state space tree you are investigating.

[5] Prove $HC \not\subseteq TSP$ decision.