(1993); and Han, Hartmann and Mehrotra (1998). Related work can be found in Hu and Tucker (1971).

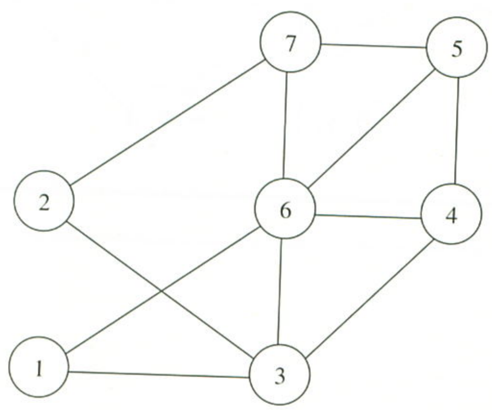
5-15 FURTHER READING MATERIALS

Tree searching techniques are quite natural and very easy to apply. For average case analysis of tree searching algorithms, we recommend Brown and Purdom (1981); Huyn, Dechter and Pearl (1980); Karp and Pearl (1983); and Purdom and Brown (1985). For branch-and-bound algorithms, we recommend Boffey and Green (1983); Hariri and Potts (1983); Ibaraki (1977); Sen and Sherali (1985); Smith (1984); and Wah and Yu (1985). For A^* algorithms, we recommend Bagchi and Mahanti (1983); Dechter and Pearl (1985); Nau, Kumar and Kanal (1984); Pearl (1983); and Srimani (1989).

For recent results, consult Ben-Asher, Farchi and Newman (1999); Devroye (2002); Devroye and Robson (1995); Gallant, Marier and Storer (1980); Giancarlo and Grossi (1997); Kirschenhofer, Prodinger and Szpankowski (1994); Kou, Markowsky and Berman (1981); Lai and Wood (1998); Lew and Mahmoud (1992); Louchard, Szpankowski and Tang (1999); Lovasz, Naor, Newman and Wigderson (1995); and Meleis (2001).

Exercises

5.1 Consider the following graph. Find a Hamiltonian cycle by some kind of tree searching technique.



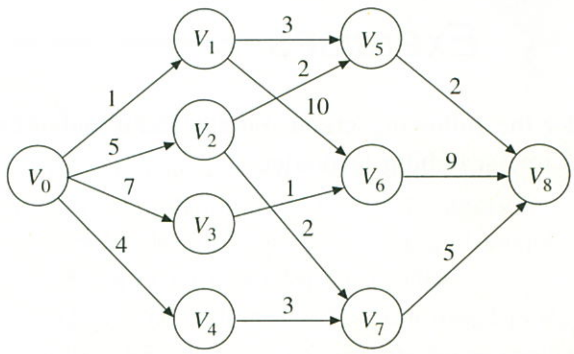
5.2 Solve the 8-puzzle problem which tests with the following initial state.

2	3	
8	1	4
7	5	6

Note that our final goal is

1	2	3
8		4
7	6	5

5.3 Find the shortest path from v_0 to v_8 by the branch-and-bound strategy.

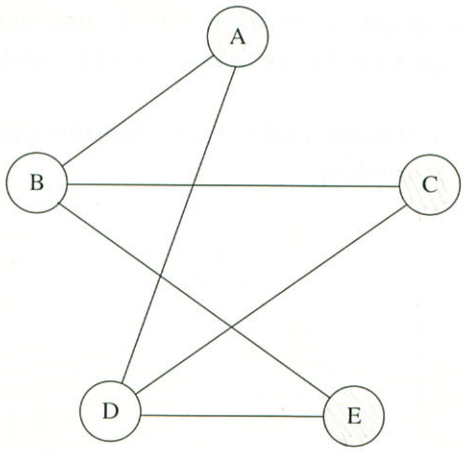


5.4 Solve the traveling salesperson problem characterized by the following distance matrix by the branch-and-bound strategy.

i \ j	1	2	3	4	5
1	∞	5	61	34	12
2	57	∞	43	20	7
3	39	42	∞	8	21
4	6	50	42	∞	8
5	41	26	10	35	∞

5.5 Solve the following sum of subset problem. $S = \{7, 1, 4, 6, 14, 25, 5, 8\}$ and $M = 18$. Find a sum whose elements add up to M. Use the branch-and-bound strategy.

5.6 Solve the vertex cover problem of the following graph by some tree searching technique.



5.7 Determine the satisfiability of the following Boolean formulas by tree searching technique.

(a) $-X_1 \vee X_2 \vee X_3$
$X_1 \vee X_3$
X_2

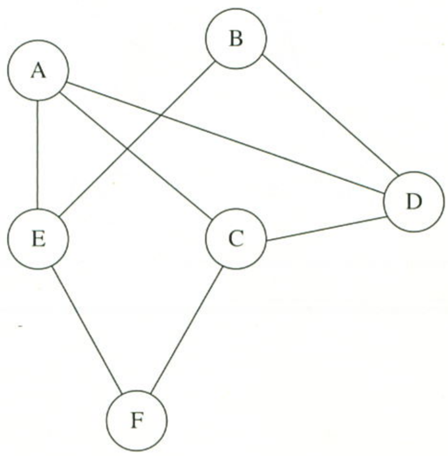
(b) $-X_1 \vee X_2 \vee X_3$
$X_1 \vee X_2$
$-X_2 \vee X_3$
$-X_3$

(c) $X_1 \vee X_2 \vee X_3$
$-X_1 \vee -X_2 \vee -X_3$

(d) $X_1 \vee X_2$
$-X_2 \vee X_3$
$-X_3$

5.8 Consider the graph in Problem 5.6. Is this graph 2-colorable? Answer this question by some kind of tree searching technique.

5.9 Consider the following graph. Prove that this graph contains a 3-clique by tree searching.



5.10 Design an experiment to test the average case performance of the algorithm solving the traveling salesperson problem based upon the branch-and-bound strategy.