

Name:

ID:

Section:

IE 400-HOMEWORK 2

Spring 2020

Question 1. a) Solve the following Knapsack Problem by using branch and bound method.

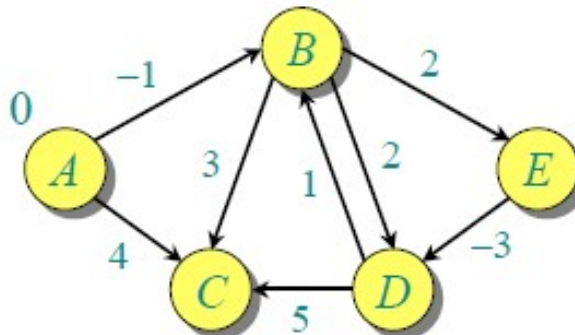
$$\begin{aligned} \max & 15x_1 + 10x_2 + 9x_3 + 2x_4 \\ \text{s.t.} & 3x_1 + 5x_2 + 3x_3 + 2x_4 \leq 14 \\ & x_i \geq 0 \text{ and integer for } i=1,2,3,4 \end{aligned}$$

b) Solve the following IP by using branch and bound method.

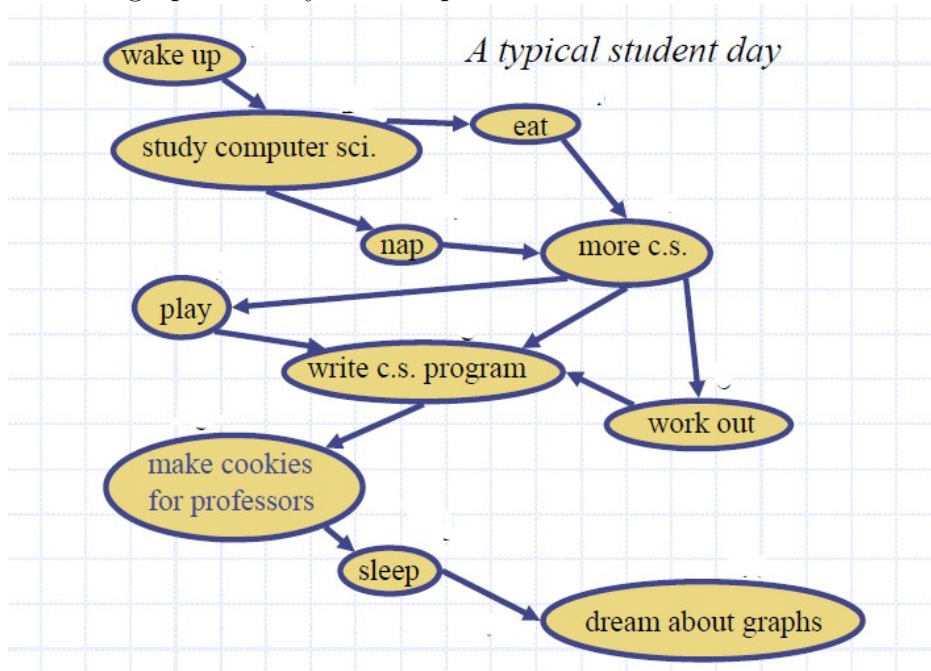
$$\begin{aligned} \max & 4x_1 + 10x_2 \\ \text{s.t.} & 6x_1 - 2x_2 \leq 21 \\ & -4x_1 + 6x_2 \leq 9 \\ & 4x_1 + 10x_2 \leq 31 \\ & x_1, x_2 \geq 0 \text{ and integer} \end{aligned}$$

Question 2. It costs \$40 to buy a telephone from the department store. Assume that I can keep a telephone for at most five years and that the estimated maintenance cost each year of operation is as follows: year 1, \$20; year 2, \$30; year 3 \$40; year 4, \$60; year 5, \$70. I have just purchased a new telephone. Assuming that a telephone has no salvage value, determine how to minimize the total cost of purchasing and operating a telephone for the next six years. Please clearly write the functional equations and the minimum total cost at the end of 6th year.

Question 3. a) Solve the following shortest path problem by using Bellman-Ford Algorithm. Please clearly write each step.



- b) Here is the typical day of a student. Find a topological ordering according to given directed graph. Clarify each step.



Question 4. Find the shortest path from node 1 to node 10 by using Dijkstra's algorithm. Please clearly write the steps and in each step clarify that which nodes are permanent and which are temporary.

