

APJ Abdul Kalam Technological University

Ernakulam II Cluster

Second Semester M. Tech Degree Examination May 2017

05ME6402 ADVANCED OPERATIONS RESEARCH

Time: 3 hrs.

Maximum: 60 Marks

1. Use a simplex tableau to solve the Linear Programming problem 12 Marks

Maximise the objective function $f = 2x + 3y$

where

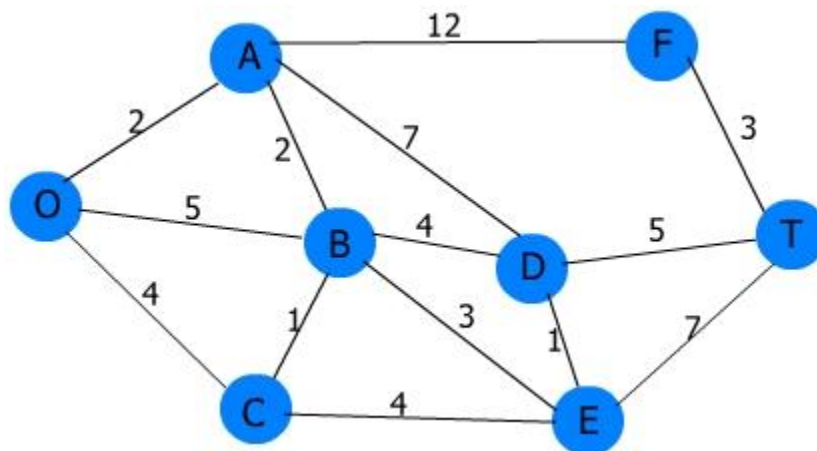
$$-x + y \leq 5$$

$$x + 3y \leq 35$$

$$x \leq 20$$

$$x \geq 0, y \geq 0$$

2. Given a weighted digraph, find the shortest directed path from O to T. 12 Marks



3. A 4-ton vessel can be loaded with one or more items. The following table gives the unit weights in tons, the unit revenue in thousands of rupees for item i . How should the vessel be loaded to maximize the total return?

Item	Weight	Revenue
1	4	70
2	1	20
3	2	40

18 Marks

OR

4. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets follow a poisson distribution with an average rate of 10 per 8 hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? 18 Marks

5. Solve the non-linear programming problem using Lagrangian multipliers

$$\begin{aligned} \text{Maximize } Z &= 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2 \\ \text{s.t } x_1 + x_2 + x_3 &= 15 \\ 2x_1 - x_2 + 2x_3 &= 20 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

OR

6. Euromerica Liquors purchases and distributes a number of wines to retailers. The purchasing manager was asked to order at least 800 bottles of each wine listed in the table below. In accordance with a long-standing company policy, at least twice as many domestic (US) bottles as imported bottles should be ordered in any ordering cycle. Market survey was conducted and revealed that no more than 10,000 bottles combined can be sold at full price, yet bottles above this amount can be sold at an average profit of \$0.70 per bottle.

The following table summarizes price and cost information for each type of wine.

Wine	Country	Cost (\$)	Selling Price
Napa Gold	US	2.50	4.25
Cayuga Lake	US	3.00	4.50
SeineSoir	France	5.00	8.00
Bella Bella	Italy	4.00	6.00

Management defined the following objectives:

- Maximize the profit. The goal was set as \$6,000
- Minimize the purchase cost. The goal was set as \$28,000
- Maximize the number of bottles sold. The goal was set as 10,000.

Set up a goal programming model to help Euromerica determine how many bottles of each type to order. 18 Marks