2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS

OPERATIONS RESEARCH
(COMMON TO COMPUTER SCIENCE & ENGINEERING AND ELECTRONICS & COMPUTER ENGINEERING)

NOVEMBER 2005

TIME – 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Discuss the following terms :

i. Slack variables

ii. Artificial variables

(b) Maximize Z = 4X + Y

Subject to
2X + 3Y ⁄ 12
X + 2Y ⁄ 4
X, Y ⁄ 0
Use simplex method *[6+10]*

2. (a) Distinguish between a transportation problem and an assignment problem.

(b) Solve the following transportation problem with transportation cost, demand and supplies as given below. *[6+10]*

Ware House
W1 W2 W3 W4 Demand
F1 19 30 50 10 7
Factory F2 70 30 40 60 9
F3 40 8 70 20 18
Supply 5 8 7 14

3. Find the sequence that minimizes the total elapsed time required to complete the following tasks Times are in hours.

Job 1 2 3 4 5 6 7 8 9 10
M1 2 3 4 15 3 6 10 15 2 8
M2 6 2 4 10 6 9 15 3 1 0 Also find the total elapsed time and idle times of each machine *[16]*

4. (a) Explain briefly the importance of Replacement Analysis.

(b) What do you mean by "Money value is not counted and counted" in Replacement Analysis.

(c) The cost of the machine is Rs.6100 and its scrap value is only Rs.100. The maintenance costs are found to be:

Year 1 2 3 4 5 6 7 8 Maintenance 100 250 400 600 900 1250 1600 2000 when should the machine be replaced? [6+6+4]

5. (a) Consider the following pay-off matrix and determine the optimal strategy.
B
A
I II III
I 6 9 4
II 5 10 7
III 9 8 9

(b) Write a note on zero-sum games [12+4]

6. Customers arrive at a Car-washing plant according to Poisson distribution with mean 2 per hour. Service time per customer is exponential with mean 25 minutes. The car space in front of the window, including that for the serviced can accommodate a maximum of 5 cars. Other cars can wait outside this space.

(a) What is the probability that an arriving customer can drive directly to the space in front of the window ?

(b) what is the probability that an arriving customer will have to wait outside the indicated space ?

(c) How long is an arriving customer expected to wait before starting service ?

(d) How many spaces should be provided in front of the window so that all the arriving customers can wait is front of the window at least 20% of the time. - [6+6+4]

7. (a) What are the factors affecting inventory control policy?

(b) Following information is provided about the lead time and the demand pattern of a system. Annual requirement 24,000 units Lead time 10days There are 240 working days per year In the past two years the rate has gone as high as 140 units per day. Calculate the required safety stock and reorder level.

i. considering the normal behavior

ii. considering variations in last two years. [4+10]

8. (a) Write a note on the application of dynamic programming.

(b) Define the following terms in dynamic programming :

i. State

ii. State variable

iii. Immediate return

*iv. Optimal return. [4*4]*