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2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS

OPERATION RESEARCH

(MECHANICAL ENGINEERING)

NOVEMBER 2005 TIME: 3 HOURS

MAX MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks
? ? ? ? ?

1. (a) Explain the following
i. Mathematical Models
ii. Functional Models
(b) Apply the principle of duality to solve the LP Problem.
Minimize Z=3X1-2X2
Subject to the constraints
X1+X2□5,
X1□4, 1□X2□6 and X1,X2□0 [4+12]

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. [4+12]
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. (a) A Computer centre has got three programmers. The centre needs three application programmes to be developed. The Head of the Computer Centre, after studying carefully the programmes to be developed, estimate the computer time in minutes required by the experts to the application programmes as follows.
Programmers Programme
A B C
1 120 100 80
2 70 90 110
3 110 140 120
Assign the programmers to the programmes in such a way that the total

computer time is least
(b) Find the sequence that minimizes the total elapsed time (in hours) required to complete all the following jobs on machines A,B,C in the order B,C,A

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	4	9	8	6	5
Machine C	5	6	2	3	4

[8+8]

4. (a) Briefly explain the reasons for replacement.
(b) The following table gives the running costs /year and resale price of equipment whose purchase price is Rs.8000.

Year	1	2	3	4	5	6	7	8
Running Cost(Rs.)	2500	2600	2800	3100	3500	3900	4400	5400
Resale Value(Rs.)	6500	5500	4700	4200	3800	3500	3500	3500

i. At what year is replacement due?
ii. If the resale value is zero, will there be any change in the replacement policy? [4+12]

5. Solve the following game by algebraic method [16]

A / B	1	2
1	-2	-4
2	-1	3
3	1	2

6. Mumbai post-office has 3 speed-post window-counters. It receives on average 45 customers per hour. Arrivals are poisson distributed and service time exponentially distributed. The post office serve on average 15 customers per hour.
(a) What is the probability that a customer will be served immediately?
(b) What is the probability that a customer will have to wait?
(c) What is the average total time that customer must spend in the post-office. [16]

7. (a) Derive the Economic Order Quantity formula for the purchase model with instantaneous replenishment and without shortages.
(b) Bata industry estimates that it will sell 24,000 units of its product for the forthcoming year. The ordering cost is Rs. 150/- per order the carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is Rs. 50%. Find economic lot size, the number of orders per year and the time between two successive orders. [8+8]
8. Solve following L.P.P by Dynamic programming
Max Z = 8x1 + 7x2 subjected to the constraints
2x1 + x2 ≤ 8
5x1 + 2x2 ≤ 15