INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Logistics Management
Diploma in Logistics Management

PAPER - 6
OPERATIONS RESEARCH AND Q.T. IN LOGISTICS

Date: 09.06.2009 Max. Marks: 100
Time: 2.00pm To 5.00pm Duration : 3 hours

Instructions:
1]. Attempt all questions in Part A
2]. Attempt any five questions in Part B
3]. Marks for Part A are 25 and marks for Part B are 75.

PART A

Q1. State true or false **Marks 5**

a). Solutions to decision problems by using simulation will not be identical to those using mathematical models.

b). Replacement theory deals with prediction of replacement costs and determination of most economic replacement policy.

c). Generally, minimization linear programming problems have less than or equal to constraints.

d). For a queuing system to be feasible, the arrival rate should be lower than service rate.

e). A solution to a transportation problem is degenerate when the number of occupied cells is less than r + c – 1.

Q2. Match the columns A and B **Marks: 10**

	A		B
1	Modi Method	a	Saddle point
2	Objective function and integer decision variables	b	A random variables with values H or T
3	Smallest value in the pay-off matrix in a row and the largest value in the column	c	Transportation Problem
4	Possible outcomes in a single toss of a coin	d	Queue will be formed
5	λ/μ is <=1	e	Integer programming problem
6	Zero duration	f	Inventory Control
7	Allocation of facilities to workers	g	Pure strategy
8	Service time	h	Hungarian method
9	A business of maximizing profits or minimizing losses	i	Negative exponential distribution
10	Economic lot size	j	Duration is zero

Q3. Fill in the blanks **Marks: 10**

i). Maximum value of a estimate is ____.

ii). In a queue model, service time rate is assumed to be ____________.

iii). A linear programming problem with three decision variables can be solved using ________ method.

iv). A random process which is time dependent is called as a __________ process.

v). PERT stands for ____________________.

vi). If the coefficients of the entering variable are either negative or zero the maximization linear programming problems using simplex method has _________ solution.

vii). If in the final simplex table, an artificial variable appears at a positive value and the solution is optimal, then such solution is a ____________ solution.

viii). If a problem involves an allocation of n different facilities to n different tasks, such a problem is called an __________ problem.

ix). The difference between latest start time and earliest start time or latest finish time and earliest finish time is called as _____ _____.

x). λ/μ for a waiting line is know as _______ _________.

PART B

Q4.A The yearly cost of two machines A and B when change money value is ignored is shown in the table below. Find the cost pattern if money value is 10% per year. Which machine is the more economical of the two?

Marks: 8

Year	1	2	3
Machine A (Rs.)	1800	1200	1200
Machine B (Rs.)	2800	200	1200

Q4.B The setup cost of a production line is Rs. 36. Usage rate is 3600 units per year. Carrying cost per unit is Rs. 2.5 per year. Determine production lot size.

Marks: 7

Q5.A Discuss queue discipline. **Marks: 5**

Q5.B At a railway yard goods trains arrive at a rate of 30 trains per day. A train requires 36 minutes of service. If arrivals are Poisson and service is exponential, find: **Marks: 5+5**

i). Expected line length
ii). Probability that queue size exceeds 10.

Q6. A retailer deals in a perishable commodity. The daily demand and supply are variable. The data for past 500 days shows following demand and supply distribution: **Marks: 15**

Supply		**Demand**	
Availability (Kg)	No. of Days	Demand (Kg)	No. of Days
10	40	10	50
20	50	20	110
30	190	30	200
40	150	40	100
50	70	50	40

The retailer buys the commodity @Rs. 20/kg and sells @Rs. 30/kg. any commodity remaining at the end of the day has no saleable value. Moreover, the loss (unearned profit) on any unsatisfied demand is Rs. 8/kg. Given the following pair of random numbers simulate six days' sales, demand and profit.

(31, 18); (63, 84); (15, 79); (07, 32); (43, 75); (81, 27)

The first random number in the pair is for supply and the second random number is for demand.

Q7.A **Marks: 10**

Three men A, B, C are available to do 3 programmes 1, 2, 3. The time that each man takes to do each programme is given in the following matrix. Find the optimal assignment.

	A	B	C
1	120	100	80
2	80	90	110
3	110	140	120

Q7.B **Marks: 5**

Write the dual of the following linear programming problem:

Minimize $Z = 3x1 - 2x2$

Subject to

$3x1 + 5x2 \geq 7$
$6x1 + x2 \geq 4$
$7x1 - 2x2 \leq 10$
$x1, x2 \geq 0$

Q8.A Explain the Hungarian method to solve an assignment problem. **Marks: 5**

Q8.B Solve the following assignment problem..

Marks: 5+5

	Time taken in hours in performing		
	Job 1	**Job 2**	**Job 3**
Worker 1	7	9	6
Worker 2	5	8	7
Worker 3	4	5	6

Q9.A When is minimax criteria in game theory? **Marks: 5**

Q9.B **Marks: 10**

Solve the game with the pay-off matrix for player A as given in the table below:

		Player B		
		B1	**B2**	**B3**
	A1	2	4	2
Player A	**A2**	1	-5	4
	A3	2	6	-2

Q10. Consider the following linear programming problem: **Marks: 15**

Maximize $Z = 3x1 + 5x2$

Subject to the constraints

$$3x1 + 2x2 <= 18$$
$$x1 + 2x2 <= 14$$
$$x1, x2 >= 0$$

Obtain the optimal solution of this problem using Graphical Method.