INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Materials Management

PAPER – 18-C
OPERATIONS RESEARCH

Date:16.06.2009 Max. Marks:-100
Time: 2.00pm To 5.00pm Duration: 3 Hours

Instructions :
1. Attempt all questions in Part A
2. Attempt any 5 questions in Part B
3. Marks for Part A are 25 and marks for Part B are 75

PART A

Marks: 10

Q.1. State whether the statements below are true or false.

a). Iconic models retain some of the physical properties of the system they represent.

b). An unrestricted variable shall have a non-negative value.

c). A zero-one integer-programming problem has all decision variables have values zero or one.

d). A transportation model if an unoccupied cell has an opportunity cost of zero, alternative solution exists.

e). In relative assignments, probabilities are assigned based proportion of an event.

f). PERT assumes probability distribution for the duration of each activity.

g). If a game has a saddle point, players play mixed strategies.

h). When a customer jockeys he does not join the key.

i). In a queue, size of the calling population is input source characteristics.

j). Total inventory costs includes only purchase cost.

Q.2. Match the columns A and B **Marks: 5**

	A		B
1	Modi Method	a	A random variable with two combination
2	$\lambda/\mu >= 1$	b	Transportation Problem
3	A possible outcome of a single toss of a coin	c	Theory of Games
4	Payoff across two business partners	d	A queue will not be formed
5	$Z = ((x- \mu) \sigma)$	e	Standard Normal Variable

Q.3. Fill in the blanks. **Marks: 10**

i). A descriptive model _____ certain aspects of a situation.

ii). In a queue model, inter-arrival rate is assumed to be _____.

iii). A utility function describes the relative _____ of an individual.

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

v). CPM stand for _____ .

vi). If a constraint in a problem has an equality sign, the corresponding dual variable shall be _____.

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 float that causes reduction in the float of the successor activity is called _____ float.

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 What is an assignment problem? Give one example. **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 Define Earliest Finish Time and Latest Start Time for an activity. **Marks: 3+3**

Q6.B **Marks:3+3+3**

A small project is composed of seven activities whose time estimates are given in the following table:

Activity Event	Preceding Activity	Time in Days
A	*	4
B	*	7
C	*	8
D	A	5
E	C	4
F	B, E	4
G	C	11
H	G, F	4

Draw the network and find the critical duration and critical path.

Q.7 Use the Simplex method to solve the following LP problem: **Marks: 15**

Maximize $Z = 3X_1 + 5X_2 + 4X_3$

Subject to the constraints

$2X_1 + 3X_2 <= 8$

$2X_2 + 5X_3 <= 10$

$3X_1 + 2X_2 + 4X_3 <= 15$

$X_1, X_2, X3$ all $>= 0$.

Q.8.A Explain 2 X 2 two-person game and 2 X m and m X 2 games. **Marks: 2+2+2**

Q.8.B **Marks: 9**

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

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

Q.9.A Explain the characteristics of the Poisson Process. **Marks: 5**

Q.9.B If the variance of a random variable X is 0.35, what is the variance of random variables 3X and 0.2X? **Marks: 10**

Q10.A Explain the transportation problem. **Marks: 5**

Q10.B **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