INDIAN INSTITUTE OF MATERIALS MANAGEMENT

Post Graduate Diploma in Materials Management

June 2011

Graduate Diploma in Materials Management

Paper No.2

QUANTITATIVE METHODS

Date: 12. 6. 2011 **Max.Marks: 100.**

Time: 2.00 pm to 5.00 pm **Duration: 3 hours**

Instructions:

1. The Question Paper is in two parts- Part A (compulsory) and Part B.
2. From Part A answer all the questions **(Total Marks 25)**
3. From Part B answer any five questions out of 8 questions .Each question carries **15 marks, total 75 marks.**
4. Use of calculator and/or mathematical tables is permitted.
5. Graph paper can be used wherever necessary.

Part A (Compulsory) (25)

Q 1 (A) State whether the following statements are true or false: 15 marks

a) In the mathematical model of a LPP the decision variables may be Integer or continuous.

b) A LPP involving three linear constraints in two variables cannot be solved by the graphical method.

c) When the total supply in a transportation problem exceeds the demand a dummy destination is added.

d) In a degenerate transportation problem, number of allocations is equal to **m + n -1**

e) If a constraint is of less than type a surplus variable is subtracted

f) A queuing problem arises if the rate of facility falls short of the arrival rate of customers.

g) An activity in a project is said to be critical when there is no Leeway in its start and finish times.

h) A Poisson distribution applies to a variable taking continuous values

l). in the net work of a project the shortest path gives the minimum duration for its completion.

j) The level of activity at which a firm fails to have enough revenues to recover all the costs is called the break-even-volume

k) In a game the point at which the maxi-min and the mini-max values differ from each other is called a saddle point.

l) Dynamic Programming is a technique for solving complex problems by making a sequence of inter-related decisions

m) Waiting time in a system is the service time minus the waiting time in the queue.

n) Exponential distribution applies to inter-arrival time

o) A good network will have only one critical path.

Q 1(B) Define the following: (2 marks each) 10 marks

a). Slack variable

b) Linear Programming

c) Economic order quantity

d) Simplex Method

e) Inventory

PART –B (Answer 5 out of 8) **Total marks: 15 x 5 = 75**

Q. 2. Solve the following problem by Simplex Method using Big M method.

Maximize Z = 3 X 1 + 2 X 2

Subject to 2 X 1 + X 2 < = 1 0

3 X 1 + 4 X 2 > =40, X 1, X 2 > = 0

Q. 3. Four different jobs can be done on four different machines. The matrix below gives the cost, in rupees, of doing job i on machine j.

	M 1	**M 2**	**M 3**	**M 4**
J 1	5	7	11	6
J 2	8	5	9	6
J 3	4	7	10	7
J 4	10	4	8	3

How the jobs should be assigned to machines so that the total cost is minimized? No machine can do two or more jobs simultaneously.

Q.4. Solve the following transportation problem. It is known that nothing can be sent from warehouse 3 to destination C. (Pg-3)

	A	B	C	**Supply**
1.	12	7	10	**180**
2.	6	14	11	**100**
3.	9	5	13	**160**
4.	7	9	11	**120**
Demand	**240**	**200**	**120**	

a) Is the solution unique?

b) Find the optimal solution.

Q5. A project has the following characteristics:

Activity	Preceding Activity	Duration in days
A	-	4
B	-	3
C	A	2
D	A	7
E	B	6
F	C	4
G	D, E	2

a). Draw the net-work diagram

b). Obtain the critical path and find the expected duration of the product

c). Also find total and free float for each activity.

Q6. (a) A company manufacturing TV sets needs tubes of a certain type. If the total Annual demand is 2000 tubes; cost per tube is Rs. 10. Determine the economic order quantity, given that

Holding cost per tube per year = Rs. 2.40

Ordering cost per order = Rs. 150

Q6. (b). The Delta Electronics produces a component at the variable cost per unit of Rs 125. The fixed cost is Rs. 25000 (Rupees twenty five thousand).

Find the break-even-point and break-even-sale; selling price per unit is Rs. 175.

Q 7. Telephone users arrive at a telephone booth following a Poisson Distribution with an average arrival rate of 12 per hour. The average time taken for a call is 3 minutes and it follows Exponential Distribution.

a) What is the probability that the booth is busy ?

b) What is the average waiting time in the queue outside the booth?

c) What would be the average time of a call if the average time in the system (Time of making a call and waiting in the queue) is not more than 5 minutes?

Q 8. Solve graphically the following linear programming problem:

Minimize Z = 3 X 1 + 2 X 2

Subject to 2 X 1 + 3 X 2 < = 8 0

5 X 1 + 2 X 2 > = 90; X 1, X 2 > = 0

Q.9. Given the Pay-Off matrix for player A, obtain the optimum strategies for both the Players A & B, and determine the value of the game.

		Player B		
		b 1	b 2	b 3
Player A	a 1	6	-3	7
	a 2	-3	0	4

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