INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Materials Management
Graduate Diploma in Materials Management
Paper No. 2 (OLD)

QUANTITATIVE METHODS

Date: 14.06.2015   **Max .Marks: 100.**

Time: 2.00 to 5.00 p.m.   **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. Each question carries 1 mark, total 25 marks. (**Total Marks 25)**

3. From Part B answer any five questions out of 7 questions .Each question carries **15 marks, total 75 marks.**

4. Use of non-scientific calculator and/or mathematical tables is permitted.

5. Graph paper can be used wherever necessary.

PART A   (1 x 25 = 25 marks)

Q1. (A) State whether the following statements are true or false: (15 Marks)

a).   A solution to an LPP is unbounded when there is no limit on constraints.

b).   A solution to an LPP is infeasible when all constrains are satisfied.

c).   Queue length is the average number of customers waiting to get service.

d).   A competitive game has infinite number of participants.

e).   A Bernoulli Trial is an experiment that has only two possible outcomes.

f).   A basic feasible optimal solution to an LPP can be obtained by Simplex.

g).   An entering variable tie in Simplex table can be resolved by arbitrary choice.

h).   Hungarian method can be used to solve an assignment problem.

i).   Total variance in a project is the total variance of every activity.

j).   Queuing theory can be used to analyze waiting line problems.

k).   Dual Simplex can be used to solve primal with infeasible initial solution.

l).   An event is the result of an experiment.

m). Inventory models minimize inventory cycle costs.

n). Balking customers affect the queue size.

o). A Binomial distribution applies to a variable taking dichotomous values.

Q1. (B) Discuss the following: **(10 Marks)**

a). Scientific Modeling

b). North West Corner Rule

c) Normal Distribution

d). Baye's Theorem

e). Beta distribution

PART B

(answer any five questions out of 8 questions .Each question carries **15 marks)**

Q.2. (A). A firm manufactures three products A, B and C. The profits per unit are Rs. 4, Rs. 4 and Rs. 4 respectively. The firm has two machines and required processing time in minutes for each machine on each product is given in the table:

		Product		
		A	B	C
Machine	X	4	3	5
	Y	2	2	4

Machines X and Y have 2000 and 1500 machine hours respectively. The firm must manufacture 100As, 200 Bs and 50Cs but no more than 150 As. Set up an LP model to maximize profit. **(5 Marks)**

Q.2. (B). Solve the following LPP by graphical method. **(10 Marks)**

Max $Z = 40 X1 + 30 X2$

Subject to

$2/5 X1 + 1/2 X2 \le 20$

$1/5 X2 \le 5$

$3/5 X1 + 3/10 X2 \le 21$

$X1 \ge 0, X2 \ge 0$

Q.3. For the following transportation cost table answer the questions given below:

(5+10 Marks)

	W1	W2	W3	W4	W5	Availability
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	100

Find the optimal transportation cost and optimal schedule using Vogel's Method.

Q.4. A fast-food chain wants to build four stores. In the past the chain has used six different construction companies and having been satisfied with each, has invited them to bid for each job. The final bids in '000 of rupees are shown. Find the assignment that shall result in minimum total cost. **(15 Marks)**

Companies (C1…) Stores (S1…)

	C1	C2	C3	C4	C5	C6
S1	85.3	90	87.5	82.4	89.1	91.3
S2	78.9	84.5	99.4	80.4	89.3	88.4
S3	82.0	31.3	28.5	66.5	80.4	109.7
S4	84.3	34.6	86.2	83.3	85.0	85.5

Q.5. 1. Construct a PERT network for the project shown in the table below.
  2. Determine the critical path and its length.

(8+7 Marks)

Activity	Time in weeks
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-10	5
9-10	7

Q.6.(A).   What is inventory and inventory costs   **(2+3 Marks)**

Q.6.(B).   A Chemical Company has a soft drink product that has a constant annual demand rate of 4500 cases. A case of the soft drink costs Rs.4/-. Ordering costs are Rs.40/- per order and holding costs is 2.5% of the value of the inventory. Find economic order quantity and number of orders.   **(5+5 Marks)**

Q.7.a.   Explain customer behavior in the queue system   **(5 Marks)**

Q.7.b.   On a network router, measurements show the packets arrive at a mean rate of 125 packets per second (pps), the router takes about 2 millisecs to forward a packet. Assuming an M/M/1 model
  - What is the router utilization factor?
  - What are the average number packets in the router? **(5+5 Marks)**

Q.8.   **(15 Marks)**

Solve the LPP using Simplex Method:
  Minimize $Z = 4X_1 + 3X_2 + 3X_3$

Subject to the constraints:
  $2X_1 + 3X_2 + 2X_3 <= 440$
  $4X_1 + 3X_3 <= 470$
  $2X_1 + 5X_2 <= 430$

  $X_1, X_2, X_3 >= 0$

Q.9.   Solve the following game.   **(15 Marks)**

		Player B				
		B1	B2	B3	B4	B5
Player A	A1	-4	-2	-2	3	1
	A2	1	0	-1	0	0
	A3	-6	-5	-2	-4	4
	A4	3	1	-6	0	-8

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