



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

June 2015

QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH

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.
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PART A

(1 x 25 = 25 marks)

- Q1. (A) State whether the following statements are true or false: (15 Marks)**
- a). Variables are elements, features or factors that are liable to vary or change.
 - b). A two variable LPP problem cannot be solved by Simplex method.
 - c). Multi-criteria model solves the problems with multiple goals.
 - d). A feasible solution to an assignment problem is a basic feasible solution.
 - e). Customers balks when he moves from one queue to another for fast service.
 - f). PERT uses activity oriented network.
 - g). An arrival pattern describes how a customer would be a part of the waiting line.
 - h). Sequencing determines optimal order for a number of jobs to be performed on finite number of machines.
 - i). Inter-arrival time follows an exponential distribution.
 - j). Cost of maintenance is inversely proportional to the level of maintenance.
 - k). The outcome of an act is called states of nature.
 - l). Capital budgeting is the decision of long term investment.
 - m). Money supply, inflation rates, interest rates can determined through economic forecasts.
 - n). μ indicates the arrival rate in a waiting line.
 - o). An exponential distribution applies to a variable taking discrete values.

Q1 (B) Define the following:

(10 Marks)

- a). Mixed Strategy
- b). Total Float
- c). Markov Process
- d). Critical Activity
- e). Back Order

PART B

(answer any five)

(5 x15 = 75 marks)

Q.2. (A).

(5 Marks)

A manufacturer produces two types of models M1 and M2. Each model of the type M1 requires 4 hours of grinding and 2 hours of polishing; where as each model of M2 requires 2 hours of grinding and 5 hours of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works 60 hours a week. Profit on M1 model is Rs.3.00 and on model M2 is Rs.4.00. Whatever produced in a week is sold in the market. How should the manufacturer allocate his production capacity to the two types of models, so that he makes maximum profit in a week?

Q.2. (B).

(10 Marks)

Maximize $Z = 50x + 18y$
Subject to the constraints
 $2X + Y \leq 100$
 $X + Y \leq 80$
 $X \geq 0, Y \geq 0$

Q.3. Minimize the costs in the given transportation table and find the optimal solution by using Vogel's method. **(15 Marks)**

FROM \ TO	1	2	3	Supply
1	5	4	3	100
2	8	4	3	300
3	9	7	5	300
Demand	300	200	200	

- Q.4.** A taxi company has four taxis, 1, 2, 3 and 4, and there are four customers, P, Q, R and S requiring taxis. The distance between the taxis and the customers are given in the table below, in kilometers. The taxi company wishes to assign the taxis to customers so that the distance traveled is a minimum. Solve the problem using Hungarian Method and find the optimal assignment. **(15 Marks)**

		Customers			
		P	Q	R	S
Taxis	1	10	8	4	6
	2	6	4	12	8
	3	14	10	8	2
	4	4	14	10	8

- Q.5.** For the following list of activities:

- (A) Draw the Network. **(5 Marks)**
- (B) Find, earliest start time, latest finish time, project completion time and the critical path. **(10 Marks)**

Activity:	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration: (Weeks)	15	15	3	5	8	12	1	14	3	14

- Q.6. (A).** Explain the importance of EOQ in inventory management. **(5 Marks)**
- (B).** ABC Ltd. is engaged in sale of footballs. Its cost per order is Rs.400 and its carrying cost unit is Rs.10 per unit per annum. The company has a demand for 20,000 units per year. Calculate the order size, total orders required during a year, total carrying cost and total ordering cost for the year **(10 Marks)**

- Q.7.** Consider a disk drive that can complete an average request in 10 ms. The time to complete a request is exponentially distributed. Over a period of 30 minutes, 117,000 requests were made to the disk.
- How long did it take to complete the average request?
 - What is the average number of queued requests?
 - What is the utilization factor?
- (5+5+5 Marks)**

Q.8.

Maximize

(15 Marks)

$Z = 4X_1 + 6 X_2$ using the Simplex Method

Subject to the constraints

$$-x_1 + x_2 \leq 11$$

$$x_1 + x_2 \leq 27$$

$$2x_1 + 5x_2 \leq 90$$

And non-negativity constraints

$X_1 \geq 0$ and $X_2 \geq 0$

Q.9.

Solve the following game by property of dominance.

(15 Marks)

		Player B		
		B1	B2	B3
Player A	A1	0	-2	7
	A2	2	5	6
	A3	3	-3	8
