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

Dec 2015

QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH

Date: 13.12.2015　　　　　　　　　　　　　　　**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 8 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 　　　　　　　　　　(25x1 = 25 marks)
(**Compulsory)**

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

(a). Integer programming problems are a special class of linear programming problems.

(b) A sequencing problem is concerned with the order in which a number of tasks can be performed.

(c) Goal programming handles multi objective situations.

(d. Markov Process is used to estimate probabilities of brand switching

(e). The shortest path in the network of a project always gives the minimum duration of completion of the project.

(f) Decision theory deals analytically with decision making under certainty.

(g) In Laplace Principle of decision theory the various events are taken as equally probable.

(h). In deterministic inventory model, orders of unequal size are placed.

(I). A network consists of a set of events connected by directed line segments.

(j) An assignment problem with six workers and six jobs has 720 assignments possible.

(k) To apply simplex method the R.H.S. of a linear constraint may be held negative

(l) In fair play of service the basis of first-come-first-served is the ideal one.

(m) In simulation the parameters are manipulated in an artificial environment.

(n). In Markov stochastic process of brand switching the customer's next brand choice depends only upon his immediately preceding brand choice.

(o).Vogel's approximation method is applicable to assignment problems.

Q.1 (B). **Fill in the blanks :**

(a). Arrival rate in queuing theory follows _____ probability distribution.

(b). In queuing theory S I R O stands for _____

(c). E.O.Q is the order lot size when holding cost is _____ to the equitable cost of
orders in a given period of time.

(d) Decision making is an _____ part of management.

(e) Sequencing is concerned with determining the optimal _____
in which a set of given jobs may be performed.

PART B
(answer any five)   (5 x15 = 75 marks)

Q.2. (a). Explain the objective of sequencing theory in manufacturing.

(b). Seven jobs are to be done in order on two machines I and II.

Processing times in hours are given below:

Jobs

	A	B	C	D	E	F	G
M 1	7	25	31	13	21	23	19
M II	17	21	21	13	25	3	7

(a). Find the total elapsed time

(b). Total Idle time of the two machines.

Q.3. (a). Minimize Z = 5 X1 + 8 X2 by graphical method subject to the linear constraints :

X1 + X2 < = 5

X 1 < = 4, X 2 > = 2

X1 > = 0, X2 >= 0

(b). Times in hours to do four jobs by four workers is given below. Determine
the optimal time assignment.

Jobs

Workers	A	B	C	D
1	40	35	46	62
2	52	37	58	50
3	44	47	43	59
4	36	40	55	50

Q4. (a). Briefly explain the advantages of replacement policy.

(b). A machine costs rupees thirty thousand. The running cost and resale values
over the years are given below :

Year	1	2	3	4	5	6	7
Running cost	2000	4000	6000	8000	10000	12000	14000
Resale Value	15000	14000	12000	9500	9000	8000	7000

At the end of which year the machine should be replaced if all other conditions remain
the same.

Q.5. A bank operates a single facility ATM machine. Consumers arrive at the rate of 10
customers per hour. A single ATM transaction on the average takes 3 minutes.
Assuming Poisson-exponential single server Model (FCFS/) find :
(a). The average waiting time of a customer before service.
(b). Average number of customers in the system.
(c). Probability that the ATM is idle.

Q.6. Write a brief note (about 150 words) on any two of the following :
(a) Decision tree
(b). Markov Process
(c). Simulation
(d). Integer programming.
(e) Difference between Statistical techniques and Operations Research

Q 7. (a). What information is obtained from the network of a Project and how it helps in the execution of the project ?

(b). Estimated times of the activities of a project are given below :

Activity of Project	1- 2	1-3	1-4	2- 6	2-5	3-5	4-7	6 -7	5-7
Optimistic Time	6	8	3	5	8	7	6	6	14
Most likely time	8	20	4	10	10	8	9	13	16
Pessimistic Time	10	22	5	15	12	9	12	20	18

(i). Draw the network.

(ii). Indicate the critical path and

(iii). Find critical duration of the project.

Q.8. A shopkeeper purchases in the beginning of the year and once only simple calculators at the rate of Rs. 160 per piece. His selling price is fixed and at M.R.P. of Rs. 200 per calculator. His estimate of annual demand at his shop, as based on experience, is between, 10 to 12 calculators. If some calculators remain unsold, he can dispose-off these at the rate of Rs. 60 per piece. For his various decisions of purchase (courses of action) :

(a). Write down the pay-off table

(b). Make the regret table.

Q.9.(a). A manufacturing company produces a single product whose selling price is Rs. 20 per unit and the variable cost is Rs. 16 per unit. If the annual fixed cost of the company is estimated to be Rs. 130000.,find the break-even point in units and in rupees.

(b). The total requirement of a particular item in a year by a firm is 8000 units. The ordering cost per procurement is Rs. 100 and the holding cost per unit is Rs. 2. 50. per year. Determine the economic lot size per order and the number of orders in a year.

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