



**INDIAN INSTITUTE OF MATERIALS MANAGEMENT**  
**Post Graduate Diploma in Materials Management**  
**Graduate Diploma in Materials Management**  
**Paper No. 2**

**Dec 2017**

**QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH**

**Date: 10.12.2017**

**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**  
**( Compulsory)**

**( 25 x1 = 25 marks)**

**Q.1 State TRUE or FALSE:**

**[ 1 Mark Each]**

- a) A feasible solution is a solution for which all constraints are satisfied.
- b) The selection of the appropriate order in which waiting customers are served is called sequencing.
- c) The time lag required to obtain the delivery of fresh supplies is Safety Stock.
- d) Payback Period is period required to recover original cash outflow invested in a project.
- e) Fixed costs remain unchanged within a relevant range of activity.
- f) Simulation is imitation of reality.
- g) North West Corner method is used to solve Assignment Problem.
- h) A network is a logical and chronological set of activities and events.
- i) Trend is the general tendency of the data to increase or decrease or stagnate over a long period of time.
- j) Wherever there is a problem of optimization , there is scope of application of Operations Research.

**Q.2 Fill in the blanks:**

**[ 1 Mark Each]**

- a) CPM stands for \_\_\_\_\_.
- b) PERT stands for \_\_\_\_\_.
- c) Probability of a customer waiting in a queue can have a minimum value of \_\_\_\_\_.
- d) NPV stands for \_\_\_\_\_.
- e) ROI stands for \_\_\_\_\_.
- f) EOQ stands for \_\_\_\_\_.
- g) LPP is \_\_\_\_\_.
- h) FIFO stands for \_\_\_\_\_.
- i) North West Corner method is used to solve \_\_\_\_\_ problem.
- j) The objective of transportation problem is to \_\_\_\_\_ the transportation cost.

**Q.3 Match the columns A & B:****[ 1 Mark Each]**

(1) Least Cost Method	(A) Two variable LPP
(2) Inventory Management	(B) Service Rate
(3) Graphical Method	(C) Safety Stock
(4) Hungarian Method	(D) Transportation Problem
(5) Exponential Distribution	(E) Assignment Problem

**PART B****(Answer any five)****( 5 x15 = 75 marks )**

Q.4 An automobile company uses bolts at an approximate consumption rate of 2500 kg per annum. The bolts cost Rs 30 per kg and the company estimates that it costs Rs 130 to place an order and the inventory carrying cost is 10% per annum. How frequently should orders for bolts be placed and what quantity should be ordered?

**15 marks**

Q 5 **WRITE SHORT NOTES ON ANY Three ( 3 x5 = 15 marks)**

- Markov chain process
- Monte Carlo simulation
- Decision tree
- Difference between PERT and CPM.

Q.6 Five jobs are to be assigned to five men. The cost(in INR) of performing the job by ach man is given in table as per below. The assignment has restrictions the job 4 cannot be performed by man 1 and job 3 cannot be performed by man4. Find the optimal assignment of job and its cost involved.

**15 marks**

		Jobs				
		1	2	3	4	5
Men	1	16	12	11	x	15
	2	13	15	11	16	18
	3	20	21	18	19	17
	4	16	13	x	16	12
	5	20	19	18	17	19

Q.7 Solve the following by using Simplex Method.

**15 marks**

Maximize

$$Z = 6x + 4y$$

Subject to –

$$2x + 3y \leq 120$$

$$2x + y \leq 60$$

Where  $x, y \geq 0$ .

Q.8 (a) What are the characteristics and limitations of a linear programming problem? **10 marks**

(b) The Oswal Hardware sells fasteners of Rs 10,00,000/- annually. Ordering cost is Rs 2,500/- per order. Carrying cost is 12.5% of average inventory value. Find out optimal order size, number of orders per year and cycle period. **5 marks**

Q.9 (a) What is Operations Research? Discuss the advantages and limitations of Operations Research. **10 marks**

(b) A machine costs INR 500 to operate, while maintenance costs are zero for the first year, increasing by INR 100 every year. If the interest rate is 5% every year, determine the best age at which the machine should be replaced. **5 marks**

Q.10 (a) What is payback period? How is it useful in decision making? What are the limitations of payback period? **10 marks**

(b) Solve the following problem by using Graphical Method: **5 marks**

$$\text{Maximize } Z = 3x + 2y$$

Subject to-

$$2X + y \leq 100$$

$$x + y \leq 80$$

$$x \leq 40$$

Where  $x, y \geq 0$ .

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