



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

**Dec 2014**

**QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH**

**Date: 14.12.2014**

**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**

**( 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 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     |

**Q.3 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.

**PART B**  
**(answer any five)**

**( 5 x15 = 75 marks )**

Q.4 (a) What are the advantages and limitations of Game Theory?

(b) Mumbai Railway Station has a ticket counter. During the rush hours , customers arrive at the rate of 10 per hour. The average number of customers that can be served is 12 per hour. Find out the following:

- (i) probability that the ticket counter is free  
(ii) average number of customers in the queue.

Q.5 Find out the minimum cost of the following transportation problem by stepping stone method:

Source	Distributors			Supply
	A	B	C	
1	2	1	5	10
2	7	3	4	25
3	6	5	3	20
<b>Demand</b>	<b>15</b>	<b>22</b>	<b>18</b>	<b>55</b>

Q.6 (a) Explain the difference between a transportation and assignment problem.

(b) The Njoy Toyz Company has four men available for work on separate jobs. Only one man can work on any one job. The cost of assigning each man to each job is given in the following table. Please assign men to jobs so that the total cost of assignment is minimum.

		Jobs			
		1	2	3	4
Men	A	20	25	22	28
	B	15	18	23	17
	C	19	17	21	24
	D	25	23	24	24

Q.7 Solve the following by using Simplex Method.

Maximize  
 $Z = 6x + 4y$

Subject to –

$2x + 3y \leq 120$   
 $2x + y \leq 60$

Where  $x, y \geq 0$ .

**Q.8** Auto car service provides a single channel water wash service. The incoming arrivals occur at the rate of 4 cars per hour and the mean service rate is 8 cars per hour. Assume that arrivals follow a Poisson distribution and the service rate follows an exponential probability distribution. Determine the following measures of performance:

- (a) What is the average time that a car waits for water wash to begin?
- (b) What is the average time a car spends in the system?
- (c) What is the average number of cars in the system?

**Q.9** 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.

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

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

$$\text{Maximize } Z = 3x + 4y$$

Subject to-

$$X + y \leq 450$$

$$2x + y \leq 600$$

Where  $x, y \geq 0$ .

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