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

Dec 2014

QUANTITATIVE METHODS

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 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 (Compulsory)

(Each question caries 1 mark x 25 = 25 marks)

Q.1 (A). State whether the following statements are true or false : 15 marks

1. Service rate and service time in a queue system are reciprocal of each other.
2. In any transportation problem the aggregate demand and aggregate supply always match with each other.
3. Most commonly used methods to obtain an initial feasible solution to a transportation problem are NWCR, LCM and Least Penalty method.
4. A transportation problem always has a unique optimal solution
5. A project cannot have two critical paths.
6. Hungarian Method fails to solve a maximization assignment problem.
7. A. Basic Feasible solution to an LPP is to degenerate if number of allocations is more than m + n - 1.
8. At Break - Even point of sales there is neither profit nor loss.
9. Exponential probability distribution applies to inter- arrival times.
10. E.O.Q. is the quantity when holding cost is equal to the ordering cost.
11. A dummy activity in a project consumes a fixed amount of resources.
12. Every minimization LPP has a dual maximization LPP.
13. Replacement of equipment is concerned only with financial implications,
14. An assignment problem can be formulated as a transportation problem.
15. With increase in the holding cost, the E. O. Q. also increases.

Q.1(B). Fill in the blanks : 10 marks

1. In periodic review system of inventory management, the stock is usually replenished at _____time intervals.
2. Linear constraints in a LPP are mathematically expressed as_____
3. Graphic Method to solve a LPP can be used only when _____ variables are involved.
4. A basic feasible solution to a Transportation problem _____Rim conditions.
5. IRR is the rate at which the NPV of investment is _____
6. Contribution margin is equal to sale price _____ variable cost.
7. When a machine deteriorates gradually _____ money is required to be spent on maintenance.
8. In an assignment problem multiple solutions _____ exist.
9. P E R T stands for _____
10. If λ is the arrival rate and μ is the service rate then the waiting time in the system is given by _____

Part B (5 x 15 = 75 marks)

(Answer any five questions)

Q. 2. Solve the following minimization assignment problem:

Workers	Job I	Job II	Job III	Job IV
W 1	5	0	11	27
W2	17	2	23	15
W3	9	12	8	24
W4	1	5	20	15

Q. 3. In a bank branch, at a window 18 customers are served per hour on the average and the average arrival rate is 12 per hour.

(a). Find the average traffic intensity

(b). If service times are assumed to be exponentially distributed, what is the probability that :

(i). A customer will be free within 3 minutes

(ii). A customer will be served in more than 12 minutes

Q.4. The Project activities and durations in days are given below :

activities	1-2	1-3	2-4	2-5	3-4	4-6	5-6	6-7
Duration	6	4	5	3	6	8	4	3

(a). Draw the project net-work

(b). Find the critical path and critical duration

(c). If the duration of (4-6) is reduced to 4 days what will be the critical duration ?

Q.5. Determine the optimal solution to the following transportation problem applying MODI method.

Sources	**D 1**	**D2**	**D 3**	Supply
S 1	6	4	9	70
S2	20	6	11	20
S3	7	12	8	60
Demand	**90**	**20**	**40**	

Q.6. Solve the following Linear Programming Problem :

Maximize Z = 7 x1 + 4 x 2

Subject to x 1 + 2 x 2 < = 6

4 x 1 + 3 x 2 > = 12

x1 >= 0, x 2 > = 0

(a).By Graphical Method **(7 marks)**

(b) By Simplex Method **(8 marks).**

Q.7. (a). Explain the need for replacement of machines, men and other equipment in a firm after some period of time.

(b). A firm has purchased a machine for Rs. 12000 and the installation charges are Rs. 2500. The estimated average maintenance costs (M . C) and the forecasted resale values in various years are as given below:

Year	1	2	3	4	5	6	7	8	9
M. C.	200	700	950	1450	2050	2900	4000	4800	6000
Resale	8000	6000	3000	2000	1000	1000	1000	1000	1000

Determine after how many years the machine should be replaced provided that all values remain unchanged ?

Q.8. (a). Briefly describe the components of a Time Series.

(b). The consumptions of a brand of refined oil in a city during 2008-2013 are given (in kilo liters) as below :

YEARS	2008	2009	2010	2011	2012	2013	2014
consumption	70	80	82	73	84	89	82

Estimate the consumption for the year 2015.

Q.9. (a). Explain briefly the A B C analysis Technique

(b). Solve the following game :

		Player A	
		a1	**a2**
Player B	**b1**	**7**	**-6**
	b2	**-5**	**3**

****