INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Materials Management
PAPER – 18 C (OLD)
OPERATIONS RESEARCH.

June 2015

DATE: 20.06.2015 **Max. Marks: 100**
TIME: 2.00 p.m to 5.00 p.m. **Duration: 03 Hrs.**

Instructions:

1. **The question paper is in two parts.**
2. **Part A is compulsory. Each question carries one mark** **Total 25 marks**
3. **In part B answers 5 questions out of 8. Each question carries 15 marks.** **Total 75 marks**

PART A 25 marks

Compulsory -Each question carries 1 mark

Q.1. State true or false. **Marks: 10**

1.1 Linear Programming is an optimization technique.

1.2 Feasible area contains all possible solutions to the given problem.

1.3 Cutting plane algorithm is used to solve Transportation Problem.

1.4 In a game there are at least two players.

1.5 PERT is used for project monitoring and control.

1.6 Heuristic programming uses rule of thumb.

1.7 Probability programming evaluates risks and uncertainties on a decision.

1.8 Customer behavior affects the queue size.

1.9 Markov analysis is state specific analysis.

1.10 Every primal has a dual problem.

Q.2 Fill in the blanks. **Marks: 10**

2.1 Goal programming deals with optimization of multiple _____.

2.2 When all variables are constrained to be integers, _____ programming is used.

2.3 An artificial variable with positive value is an _____ in Simplex Algorithm.

2.4 A random variable is also called as a _____ variable.

2.5 Safety stock reduces the probability of _____ of items.

2.6 A maximizing player minimizes his _____.

2.7 PERT can also be used in planning the _____.

2.8 The renege is a type of behavior in a _____.

2.9 Theory of random numbers is used in _____.

2.10 Stock outs can be minimized with the help of _____.

Q.3 Expand the following. **Marks: 05**

3.1 Jockey

3.2 CPM

3.3 NIFO

3.4 PERT

3.5 LCFS

PART B

75 marks

(Attempt any 5 Questions)

Q.4. A company makes two products (X and Y) using two machines (A and B). Each unit of X that is produced requires 50 minutes processing time on machine A and 30 minutes processing time on machine B. Each unit of Y that is produced requires 24 minutes processing time on machine A and 33 minutes processing time on machine B.

At the start of the current week there are 30 units of X and 90 units of Y in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours.

The demand for X in the current week is forecast to be 75 units and for Y is forecast to be 95 units. Company policy is to maximize the combined sum of the units of X and the units of Y in stock at the end of the week.

- Formulate the problem of deciding how much of each product to make in the current week as a linear program. Solve this linear program graphically. **(15 marks)**

Q.5 An organization has four destinations and three sources for supply of goods. The transportation cost per unit is given below. The entire availability is 700 units which exceeds the cumulative demand of 600 units. Decide the optimal transportation scheme for this case. **(15 Marks)**

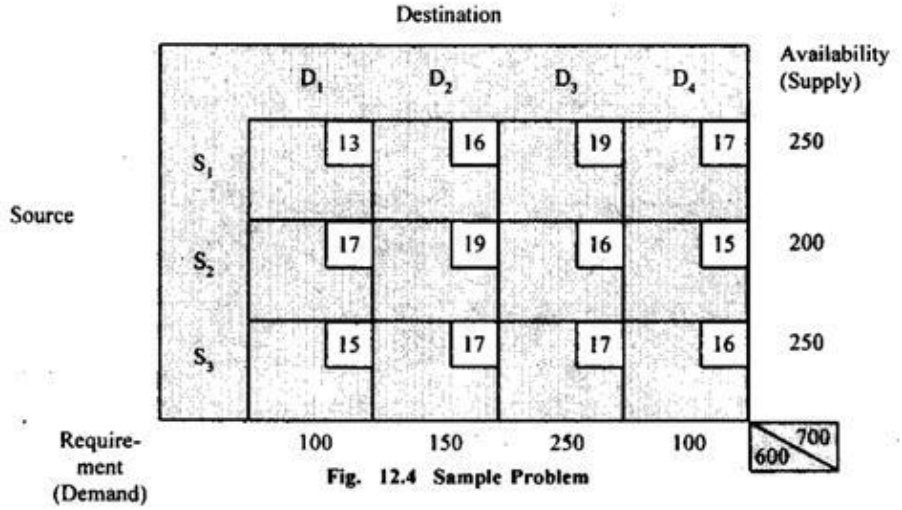

Fig. 12.4 Sample Problem

Q.6. 1. Construct a PERT network for the project shown in the table below.

2. Find all the early and late event times and the event slack.

3. Determine the critical path and its length. **(15 Marks)**

Activity	Preceding Activity	Time in weeks
A	-	2
B	A	5
C	A	2
D	B, C	4
E	B	3
F	D, E	5

Q.7. Solve the LPP using Simplex Method:

Minimize $Z = 4X_1 + 3X_2 + 3X_3$

Subject to the constraints:

$2X_1 + 3X_2 + 2X_3 <= 440$

$4X_1 + 3X_3 <= 470$

$2X_1 + 5X_2 <= 430$

$X_1, X_2, X_3 >= 0$ **(15 Marks)**

Q.8. A Chemical Company has a soft drink product that has a constant annual demand rate of 4500 cases. A case of the soft drink costs Rs.4/-. Ordering costs are Rs.40/- per order and holding costs is 2.5% of the value of the inventory. Find economic order quantity and number of orders. **(15 Marks)**

Q.9. A fast-food chain wants to build four stores. In the past the chain has used six different construction companies and having been satisfied with each, has invited them to bid for each job. The final bids in '000 of rupees are shown. Find the assignment that shall result in minimum total cost. **(15 Marks)**

Companies (C1…) Stores (S1…)

	C1	C2	C3	C4	C5	C6
S1	85.3	90	87.5	82.4	89.1	91.3
S2	78.9	84.5	99.4	80.4	89.3	88.4
S3	82.0	31.3	28.5	66.5	80.4	109.7
S4	84.3	34.6	86.2	83.3	85.0	85.5

Q.10. a) A service station has a central store where mechanics arrive to take spare parts. The average arrival rate of mechanics is 6 per hour and the service rate of one attendant who mans the store is 8 per hour. Assuming that the arrival rate is Poisson and the service rate is exponential, determine:

i) Expected time spent by a mechanic in the system.

ii) Expected time spent by a mechanic in the queue

iii) Expected number of mechanics in the queue

iv) Probability that the attendant is idle. (12 marks)

Q.10. b) Define Jockeying, Balking and Reneging (3 marks)

Q.11. Write short notes on any five.

a) Project crashing

b) Sensitivity analysis

c) Markov chains

d) Sequencing

e) ABC analysis

f) Game theory (5x3=15 marks)

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