

VPM's
DR VN BRIMS, Thane
Programme: PGDM (2014-16)
Fourth Trimester (Operations) Examination September 2015

Subject	Quantitative Methods for Operations		
Roll No.		Marks	60 Marks
Total No. of Questions	7	Duration	3 Hours
Total No. of printed pages	2	Date	28.09.2015

Note: Q1 is compulsory and solve any FOUR from the remaining SIX questions.

Q1) 20 Marks (Compulsory)

A project consists of the following activities. Find the floats for all the activities, total duration of the project, and the critical path.

Activity	Preceding Activity	Duration (weeks)
A	-	5
B	-	7
C	-	3
D	A	10
E	A	9
F	C	12
G	B, E, F	6
H	B, E, F	4
I	D, G	11

Attempt Any FOUR from the Remaining SIX Questions

Q2) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

A company is buying some filing cabinets. Cabinet X costs Rs. 100 per unit, requires six square feet of floor space, and holds eight cubic feet of files. Cabinet Y costs Rs. 200 per unit, requires eight square feet of floor space, and holds twelve cubic feet of files. The company has a budget of Rs. 1,400 for this purchase, though you don't have to necessarily spend all the budget. The office has room for no more than 72 square feet of cabinets. How many of which model should you buy, in order to maximize storage volume? Use graphical method.

- a) How many cabinets of X should be bought?
- b) How many cabinets of Y should be bought?
- c) What is the maximum storage volume?

Q3) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

A cement company has three factories which manufacture cement which is then transported to three distribution centers. The quantity of monthly production of each factory, the demand of each distribution center and the associated transportation cost per quintal are given as follows.

	Warehouses			Monthly Production
	D	E	F	
Factories	A	5	1	7
	B	6	4	6
	C	3	2	5
				10
				80
				15

Monthly Demand		75	20	50	
-----------------------	--	----	----	----	--

- a) In the optimal allocation, what is the quantity of stock transported from A to D, E and F?
- b) What is the cost of the optimal allocation?
- c) In the optimal allocation, what is the allocation to E from A, B, and C?

Q4) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

A company orders an item and maintains its inventory. The details about the same are as follows. Assume 300 working days in a year.

Annual Demand (D) = 3,300 units
 Ordering Cost (S) = Rs. 150 per order
 Holding Cost (H) = Rs. 11 per unit per annum
 Lead Time (L) = 4 days

- a) What are the different costs associated with inventory?
- b) For the above problem, what is the economic order quantity?
- c) For the above problem, what is the safety stock?

Q5) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

Assume that at a bank teller window the customers arrive in their cars at the average rates of twenty per hour according to a Poisson distribution. Assume also that the bank teller spends an average of two minutes per customer to complete a service, and the service time is exponentially distributed. Customers, who arrive from an infinite population, are served on a first come first served basis, and there is no limit to possible queue length.

- a) What is the expected waiting time in the system per customer?
- b) What is the mean number of customers waiting in the system?
- c) What is the probability of zero customers in the system?

Q6) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

The times taken by 4 workers A, B, C, and D to perform 4 tasks are as given in the table. The aim is to assign the workers in such a way that minimizes the time. One worker can perform only one job and one job can be performed by only one worker.

	1	2	3	4
A	81	14	36	40
B	20	31	25	26
C	30	87	19	70
D	23	56	60	18

Treating this as an integer programming problem answer the following questions.

- a) Formulate the objective function for the problem.
- b) Formulate the constraints for the problem.
- c) What are the constraints that will ensure that it is an integer solution?

Q7) Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks

- a) Write a short note on the importance of quantitative methods in operations.
- b) Write a short note on transshipment problem.
- c) Write a short note on cutting plane algorithm.