

VPM's
DR VN BRIMS, Thane
Programme: MMS (2014-16)
Third Semester (Operations) Examination October 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	30.10.2015

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

Q1) 20 Marks (Compulsory)

A manufacturer produces two products A and B and has his machines in operation for 24 hours a day. Production of A requires 2 hrs of processing on machine M_1 & 6 hrs on machine M_2 . Production of B requires 6 hrs of processing on machine M_1 and 2 hrs on machine M_2 . The manufacturer earns profit of Rs. 5 on each unit of A & Rs. 2 on each unit of B. Using Linear Programming determine how many units of each product should be produced in a day in order to achieve maximum profit?

Formulate this problem as an LPP to maximize the profit.
 Using Simplex method find the optimal level of production for M_1 and M_2 .

Attempt Any FOUR from the Remaining SIX Questions

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

Given below is a network from node A to node E. There are various routes possible from node A to E. A traveler wants to travel by the shortest path for the network. Use dynamic programming for solving the following questions.

Path	Duration
A-B	9
A-C	14
B-D	8
B-E	11
C-E	12
C-F	7
D-G	10
D-H	11
E-H	13
E-I	12
F-I	10
F-J	19
G-K	8
H-K	5
I-K	7
J-k	10

- a) Construct the network for the data.
- b) Construct the payoff tables for the last 2 stages of the network.
- c) Construct the payoff tables for the first 2 stages of the network and find the shortest path.

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

A company has to choose between 8 tasks to be performed. The tasks are numbered task 1, task 2, task 3 and so on. The following conditions should be selected while choosing the tasks.

Not more than 7 and not less than 5 tasks should be selected.

If task 1 is selected task 8 cannot be selected.

If task 2 is chosen task 7 has to be chosen.

One of task 5 and 6 has to be chosen.

- 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 a integer solution?

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

A company manufactures certain products and requires a part M for the same. M is produced in-house in the company in a job-shop at the rate of 60 items / day. The annual requirement of M by the assembly line is 9300 items. The setup cost of the job shop is Rs. 2,000 per setup. Assume 300 working days in a year. The holding cost per unit is Rs. 18 per annum. The cost per unit of the item is Rs. 12.

- a) For the above problem, what is the economic order quantity?
- b) For the above problem, what is the total cost?
- c) Write a short note on ABC classification?

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

A rural clinic hires its staff from nearby cities and towns on a part-time basis. The clinic attempts to have a general practitioner (GP), a nurse, and an internist on duty during at least a portion of each week. The clinic has a weekly budget of Rs. 12,000. A GP charges the clinic Rs. 400 per hour, a nurse charges Rs. 200 per hour, and an internist charges Rs. 1500 per hour. The clinic has established the following goals, in order of priority:

- (1) A nurse should be available at least 30 hours per week.
- (2) The weekly budget of Rs. 12,000 should not be exceeded.
- (3) A GP or an internist should be available at least 20 hours per week.
- (4) An internist should be available at least 6 hours per week.

Treating this as a goal programming problem

- a) Formulate the objective function for the problem.
- b) Formulate the resource constraints for the problem.
- c) Formulate the goal constraints and variable constraints for the problem.

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

- a) Write a short note on dynamic programming.
- b) Write a short note on branch and bound algorithm.
- c) Write a short note on cutting plane algorithm.