



PS – 295

6  
II Semester M.B.A. (Day/Evening) Examination, November/December 2022  
(CBCS – 2021 – 22 Onwards)

MANAGEMENT

Paper 2.6 – Quantitative Techniques and Operations Research

Time : 3 Hours

Max. Marks : 70



SECTION – A

Answer **any five** of the following. **Each** question carries **five** marks. (5×5=25)

1. Briefly explain how the techniques of operations research help in managerial decision making.
2. What is meant by a non-degenerate solution ? How is it determined in case of transportation and what does it imply for optimization ?
3. A financial consultant is given the responsibility of enhancing the profitability of a person's investments. Investments are intended in two spheres; Fixed Deposits (FDs) and Mutual Funds. The rate of returns for fixed deposits is 9 percent and for mutual funds, 7 percent. If the economy is in a boom out of the total investments, FDs and MFs can be in the ratio of 4 : 6 and a maximum of 30 percent will be the yield. If the economy is in a slump, the ratio of FDs and MFs can be 1 : 1 and the yield will be 12 percent. If the economy is in normal state, the investment will yield 15 percent with 60 percent FDs and the rest MFs. Formulate the LPP.
4. At a Veterinary clinic, there is a single vet vaccinating pups. Every 5 minutes, 20 pups arrive. The vet can vaccinate 15 pups in minutes. Assuming the arrival rate of pups follows the Poisson distribution and the vaccination time follows the exponential distribution. Determine the following :
  - a) The average number of pups in queue.
  - b) Average time a pup spends in the system.
  - c) Average time a pup waits before vaccination.

P.T.O.



5. Ten jobs are required to process on 2 machines M1 and M2. Determine the optimum sequence and total elapsed time.

Jobs	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10
<b>Machine 1</b>	14	16	20	6	14	8	10	16	10	12
<b>Machine 2</b>	8	4	12	12	10	14	4	12	14	12

6. Solve the following game by the method of mini max and maxi min principle.

		Player B				
Player A		6	4	7	8	9
		18	16	14	13	12
		25	26	27	28	22
		16	18	26	24	20
		9	6	8	10	11

7. The daily demand for dish washing liquid bottles at a department store follows a frequency pattern. Simulate the demand for the next week based on the demand pattern given below.

<b>Daily demand</b>	0	1	2	3	4	5
<b>No. of days (Total 50 Days)</b>	4	8	8	10	10	10

Simulate the demand for the next 7 days based on the following random numbers :  
18, 33, 40, 51, 60, 87, 93

### SECTION – B

Answer **any three** questions. **Each** question carries **10** marks. **(3×10=30)**

8. In a certain company, there are exactly 500 machines parts that are battery operated. The expectancy of the life of the batteries is as per data given herein, depending on the usage of the machines end of the month.

<b>End of the month</b>	1	2	3	4	5	6
<b>Probability of being exhausted</b>	0.10	0.20	0.40	0.60	0.90	1.00



Each battery costs Rs. 20 if replaced individually but if all 500 changed together then each battery will cost just Rs. 10.

You are to advise the company the following :

- a) If the company wants to make group replacement how often should it be ?
- b) Is individual replacement better ?

9. A company has four sales representatives who are to be assigned to four sales territories. The monthly sales increases estimated for each sales representative for different sales territories (in lakhs of rupees) are shown below :

	1	2	3	4
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

Suggest optimal assignment and the total maximum sales increase per month.

10. Solve the following LPP by simplex method.

$$\text{Maximize } Z = 5X_1 + 10X_2 + 8X_3$$

$$\text{S.T } 3X_1 + 5X_2 + 4X_3 \leq 60$$

$$4X_1 + 4X_2 + 4X_3 \leq 72$$

$$2X_1 + 4X_2 + 5X_3 \leq 100$$

$$\text{and } X_1, X_2, X_3 \geq 0.$$

11. Consider a project having the following activities and their time estimates :

Activity	Predecessor	T <sub>O</sub>	T <sub>M</sub>	T <sub>P</sub>
A	—	2	4	6
B	A	8	12	16
C	A	14	16	30
D	B	4	10	16
E	B, C	6	12	18
F	E	6	8	22
G	D	18	18	30
H	F, G	8	14	32





- a) Draw an arrow diagram for the project.
- b) Identify the critical path and compute the expected project length.
- c) What is the probability that the project will require in 75 days for its completion ?

## SECTION – C

**Compulsory Question.****(1×15=15)**

12. Case Study :

Determine the initial basic feasible solution and optimum solution for the transportation problem when the unit transportation costs, demands and supplies are given below :

Origin	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
O <sub>1</sub>	21	16	25	13	11
O <sub>2</sub>	17	18	14	23	13
O <sub>3</sub>	32	17	18	41	19
Demand	6	10	12	15	43