

Roll No.: _____

Paper Code: FT201

IPS Academy, Institute of Business Management and Research, Indore (MP)

(An Autonomous Institute, Established in 1994, Accredited NAAC A++)

Affiliated to Devi Ahilya University Indore (M.P.) India

End Semester Examination – June, 2023

Class/Course/Sem.- MBA (FT) II Sem.

Subject Code: MC-201

Subject – Operations Research

[Time: 3 Hours]

[Max. Marks: 60]

Note: Question paper consists of two sections (A and B).

Attempt any two questions from Section A, each question carries six marks.

Attempt any four questions from Section B, each question carries twelve marks.

Section A

1. What do you mean by operations research? Discuss the role and scope of operations research techniques in Managerial decision making.

Q2. What do you mean by assignment problem? How would you deal with the assignment problems, where

(a) the objective function is to be maximized

(b) some assignments are prohibited.

Q3. What do you understand by a queue? Give some important applications of queuing theory.

Q4. Write Short Notes on any two of the following:

(a) Pure and Mixed strategy in a game theory

(b) Degeneracy and its resolution in transportation problem

(c) Theory of Markov chains.

Section B

Q5. A dentist schedules all her patients for 30 minutes appointments. Some of the patients take more or less than 30 minutes depending on the dental work to be done. The following summary shows the various categories of work, their probabilities and time needed to complete the work.

Category of service	Time required (minutes)	Probability of Category
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check-up	15	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival times, starting at 8.00 am. Use the above random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17 and 79.

Q. 6. A firm owns facilities at six places. It has manufacturing plants at places A, B and C with daily production of 50, 40 and 60 units respectively. At point D, E and F it has three warehouses with daily demands of 20, 95 and 35 units respectively. Per unit shipping (transportation) costs are given in the following table. If the firm wants to

minimize its transportation cost, how should it route its products? Use MODI or Stepping-stone method for testing the optimality.

Plant	Warehouse		
	D	E	F
A	6	4	1
B	3	8	7
C	4	4	2

Q.7. Solve the following game and find the strategy of both the players by using principles of dominance:

Strategies of Player A	Strategies of Player B			
	B1	B2	B3	B4
A1	3	2	4	0
A2	3	4	2	4
A3	4	2	4	0
A4	0	4	0	8

8. A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the following table:

Jobs	Employees				
	E1	E2	E3	E4	E5
J1	10	5	13	15	16
J2	3	9	18	13	6
J3	10	7	2	2	2

J4	7	11	9	7	12
J5	7	9	10	4	12

How should the jobs be assigned, one per employee, so as to minimize the total man-hours? <https://www.pyqonline.com>

Q9. An engineering company is offered a material handling equipment A. It is priced at Rs 60,000 including cost of installation. The costs for operation and maintenance are estimated to be Rs 10,000 for each of the first five years, increasing every year by Rs 3,000 in the sixth and subsequent years. The company expects a return of 10 percent on all its investment. What is the optimal replacement period?

Q10. Solve the following LPP by graphical method.

$$\text{Maximize: } Z = 3x_1 + 4x_2$$

Subject to the constraints: $5x_1 + 4x_2 \leq 200$,

$$3x_1 + 5x_2 \geq 150,$$

$$5x_1 + 4x_2 \geq 100,$$

$$8x_1 + 4x_2 \geq 80$$

$$x_1, x_2 \geq 0$$

Q11. The school of international studies for population found out by its survey that the mobility of the population of a state to the village town & city is in the following probability:

From	To		
	Village	Town	city
Village	0.5	0.3	0.2

Town	0.1	0.7	0.2
City	0.1	0.4	0.5

What will be the proportion of population in village, town & city after 2 years; given that present population has proportion of 0.7, 0.2 & 0.1 in the village, town & city respectively? Also establish the relation to find the respective proportion for long run (Steady-state) using Markov chain.