

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MA DEGREE EXAMINATION MAY 2022
(Fourth Semester)

Branch – ECONOMICS

OPERATIONS RESEARCH

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 1 = 10)

- 1 Operations Research came into existence _____
(i) In the year 1940 (ii) In the military context
(iii) During World War I (iv) During World War II
- 2 Decision variables in an operations research model are _____
(i) Controllable (ii) Uncontrollable
(iii) Parameters (iv) Constants
- 3 The assignment problem is a special case of transportation problem in which number of origins _____
(i) Equals the number of destinations (ii) Is greater than the number of destinations
(iii) Is less than the number of destinations
(iv) Is less than or equal to the number of destinations
- 4 In an assignment problem involving four workers and three jobs, total number of assignments possible are _____
(i) 4 (ii) 3 (iii) 7 (iv) 12
- 5 When maximin and minimax values of the game are same, then _____
(i) There is a saddle point (ii) Solution does not exit
(iii) Strategies are mixed (iv) none of the above
- 6 Queue can form only when _____
(i) Equalization of carrying cost and procurement cost
(ii) Minimization of set up cost
(iii) Favorable procurement price
(iv) Reduced chances of stock outs
- 7 Economic Order Quantity(EOQ) results in
(i) Equalization of carrying cost and procurement cost
(ii) Minimization of set up cost
(iii) Favorable procurement price
(iv) Reduced chances of stock outs
- 8 The problem of replacement is not concerned about the _____
(i) Items that deteriorate graphically
(ii) Items that fail suddenly
(iii) Determination of optimum replacement interval
(iv) Maintenance of an item to work out profitability
- 9 The objective of network analysis is to _____
(i) Minimize total project cost (ii) Minimize total project duration
(iii) Minimize production delays, interruption and conflicts
(iv) All of the above
- 10 The slack for an activity in network, is equal to _____
(i) $LS - ES$ (ii) $LF - LS$ (iii) $EF - ES$ (iv) $EF - LS$

SECTION - B (25 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 5 = 25)

- 11 a Bring out the essential characteristics of Operations Research.

OR

Cont...

- b Explain the nature of Operations Research and its limitations.

- 12 a Explain briefly the Least Cost Method.

OR

- b Obtain an initial basic feasible solution to the following transportation using north west corner rule

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

- 13 a Narrate the properties of a game.

OR

- b For the game with the following payoff matrix, determine the optimum strategies and the value of the game

		P2	
		5	1
P1	[5	1
]	3	4

- 14 a Describe the types of inventories.

OR

- b A firm is considering replacement of a machine, whose cost price is Rs.12,200 and the scrap value, Rs. 200. The running cost in rupees are found from experience to be as follows

year	1	2	3	4	5	6	7	8
Running cost	200	500	800	1,200	1,800	2,500	3,200	4,000

When should the machine be replaced?

- 15 a Show the meaning of looping and dangling errors in network.

OR

- b Compare between PERT and CPM.

SECTION -C (40 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 8 = 40)

- 16 a Use simplex method to solve the LPP

$$\text{Max } Z = 3x_1 + 2x_2$$

$$\text{subject to } x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

- b Examine the simplex procedure to solve a linear programming problem.

- 17 a Find the initial basic feasible solution for the following transportation problem by Vogel's Approximation Method

		Destination				Supply
		D1	D2	D3	D4	
Origin	O1	11	13	17	14	250
	O2	16	18	14	10	300
	O3	21	24	13	10	400
	Demand	200	225	275	250	950

OR

- b A company has 5 jobs to be done on five machines. Any job can be done on any machine. The cost of doing the jobs on different machines are given below. Assign the jobs for different machines so as to minimize the total cost

Jobs	Machines				
	A	B	C	D	E
1	13	8	16	18	19
2	9	15	24	9	12
3	12	9	4	4	4
4	6	12	10	8	13
5	15	17	18	12	20

- 18 a Solve the following 2×3 game graphically.

Player B

Player A $\begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$

OR

- b For a single server, Poisson arrival and Exponential service time queuing system, obtain the steady state equations satisfied by the probability P_n of n customers in the system and hence obtain P_n .
- 19 a The demand rate of a particular item is 12,000 units per year. The set up cost per run is Rs. 350 and the holding cost is Rs. 0.20 per unit, per month. If no shortages are allowed and the replacement is instantaneous, determine i) The optimum run size, ii) The optimum scheduling period and iii) Minimum total expected annual cost.

OR

- b A machine costs Rs. 6,000. The running cost and the salvage value at the end of the year is given in the table below.

Year	1	2	3	4	5	6	7
Running cost	1200	1400	1600	1800	2000	2400	3000
Salvage value	4000	2666	2000	1500	1000	600	600

If the interest rate is 10 per cent per year, when should the machine be replaced?

- 20 a A small maintenance project consists of the following jobs, whose precedence relationships are given below

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration(days)	15	15	3	5	8	12	1	14	3	14

- i) Draw an arrow diagram representing the project
 ii) Find the total float for each activity
 iii) Find the critical path and the total project duration

OR

- b The following table shows the jobs of a network along with their time estimates. The time estimates are in days

Job	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
A	3	2	6	2	5	3	1	3	4
M	6	5	12	5	11	6	4	9	19
B	15	14	30	8	17	15	7	27	28

- (i) Draw the project network
 (ii) Find the critical path
 (iii) Find the probability of the project being completed in 31 days

Z-Z-Z

END