[21005]
SPECIAL DRIVE - DEC - 2022
M.B.A. DEGREE EXAMINATIONS
SECOND SEMESTER
Paper - V : OPERATIONS RESEARCH
(2016-17 and 2017-18 Admitted Batches)

Time : 3 Hours **Maximum Marks: 75**

SECTION - A

I. Answer any FIVE questions not exceeding one page each. (5×4=20)

1. Define Operations Research (O.R). Describe its nature and significance.
2. Explain Hungarian method.
3. Explain the graphical method of solving a game with a suitable example.
4. Explain the structure of a queuing system. Explain its main characteristics.
5. Explain the terms and concepts of dynamic programming problem.
6. Explain duality. Explain the economic interpretation of dual variables.
7. What are the assumptions in sequencing problem? Write the algorithm for processing n jobs through 2 machines.
8. Distinguish between PERT and CPM. What are the rules for Activity-on-Arrow network construction?

SECTION - B

II. Answer ALL questions not exceeding 4 pages. (5×8=40)

UNIT - I

1. a) Explain the methodology of O.R.

(OR)

b) Use duality to solve the following L.P.P.

Max. $Z = 2x_1 + x_2$

Subject to $x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_1 - 2x_2 \leq 1$

$x_1 , x_2 \geq 0$

UNIT - II

2. a) Solve the following transportation problem:

Prt	Project location			Supply
	A	B	C	
X	4	8	8	76
Y	16	24	16	82
Z	8	16	24	77
Demand	72	102	41	

(OR)

b) Solve the following travelling salesman problem:

		To				
		Depot	Vendor A	Vendor B	Vendor C	Vendor D
	Depot	–	3.5	3	4	2
From	Vendor A	3.5	–	4	2.5	3
	Vendor B	3	4	–	4.5	3.5
	Vendor C	4	2.5	4.5	–	4
	Vendor D	2	3	3.5	4	–

UNIT - III

3. a) Use linear programming to solve the following game:

	Player B		
Player A	B_1	B_2	B_3
A_1	1	–1	3
A_2	3	5	–3
A_3	6	2	–2

(OR)

b) Observations of past data show the following patterns in respect of inter arrival durations and service durations in a single channel queuing system. Using the random number table below simulate the queue behaviour for a period of 60 minutes and estimate the probability of the service being idle and the mean time spent by a customer waiting to be served.

Inter arrival time		Service time	
Minutes	Probability	Minutes	Probability
2	0.15	1	0.10
4	0.23	3	0.22
6	0.35	5	0.35
8	0.17	7	0.23
10	0.10	9	0.10

Random numbers (Start at North-West corner and proceed along the row)

93	14	72	10	21
81	87	90	38	10
29	17	11	68	99
51	40	30	52	71

UNIT - IV

4. a) A physician purchases a particular vaccine on Monday each week. The vaccine must be used with in the following week, otherwise it becomes worthless. The vaccine costs Rs. 2 per dose and the physician charges Rs. 4 per dose. In the past 50 weeks. The physician has administered the vaccine in the following quantities:

Dose per week	:	20	25	40	60
Number of weeks	:	5	15	25	5

Determine how many doses the physician should buy every week.

(OR)

b) Let there be an automobile inspection situation with three inspection stalls. Assume that cars wait in such a way that when a stall becomes vacant, the car at the head of the line pulls up to it. One station can accommodate almost four cars waiting (seven in station) at one time. The arrival pattern is Poisson with a mean of one car every minute during the peak hours. The service time is exponential with a mean of 6 minutes. Find the average number of customers in the system during the peak hours, the average waiting time, and the average number per hour that cannot enter the station because of full capacity.

UNIT - V

5. a) A pharmaceutical company has 8 medical representatives working in 3 sales areas. The probability for each representative in 3 sales areas is as follows:

No. of representatives :		0	1	2	3	4	5	6	7	8
Profitability	Area 1 :	15	22	30	38	45	48	54	60	65
Probability	Area 2 :	26	35	40	48	55	62	70	76	83
(Rs. '000)	Area 3 :	30	38	44	50	60	65	72	80	85

Determine the optimum allocation of medical representatives in order to maximize the profit. What will be optimum allocation if the number of representatives, available at present is only six?

(OR)

b) The time cost estimates for the various activities of a project are given below:

Activity	**Preceeding activity**	**Time (weeks)**		**Cost (Rs.)**	
		Normal	**Crash**	**Normal**	**Crash**
A	–	8	6	8,000	10,000
B	–	7	5	6,000	8,400
C	A	5	4	7,000	8,500
D	B	4	3	3,000	3,800
E	A	3	2	2,000	2,600
F	D,E	5	3	5,000	6,600
G	C	4	3	6,000	7,000

The project manager wishes to complete the project in the minimum possible time. However he is not authorized to spend more than Rs. 5,000 on crashing. Suggest the least cost schedule for achieving the objective of the project manager. Assume that there is no indirect cost or utility cost.

SECTION - C

III. Case Study (compulsory): **(1×15=15)**

A business man has an option of selling a product in domestic market or in export market. The available relevant data are given below.

Items	**Export market**	**Domestic market**
Probability of selling	0.6	1.0
Probability of keeping delivery schedule	0.8	0.9
Penalty of not meeting delivery schedule (Rs.)	50,000	10,000
Selling price (Rs.)	9,00,000	8,00,000
Cost of third party inspection (Rs.)	30,000	Nil
Probability of collection of sale amount	0.9	0.9

If the product is not sold in export market, it can always be sold in domestic market. No other implications like interest and time.

i) Draw the decision tree using the data given above.

ii) Should the business man go for selling the product in the export market? Justify your answer.

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