CBCS SCHEME

USN | | | | | | | | | | |

15ME81

Eighth Semester B.E. Degree Examination, June/July 2024
Operation Research

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of normal distribution table is allowed.

Module-1

1 a. Define operation research and explain all phases of operation research. **(05 Marks)**

b. Old hens can be brought at Rs.20 each and young one at Rs.50 each. The old hens lay 3 eggs per week and young one lay 5 eggs per week. Each egg being worth of one rupee and thirty paise. A hen cost Rs.4 per week to feed. He has only Rs.800 to spend for hens. How many of each kind should be buy to give a profit of more than Rs.600 per week. Assuming that he cannot handle more than 200 hens, formulate the above problem as LPP model. **(11 Marks)**

OR

2 a. Explain the limitations of operation research. **(05 Marks)**

b. Solve the below given LPP graphically and find the value of 'Z'.

Minimize $Z = 1.5x_1 + 2.5x_2$

$$x_1 + 3x_2 \geq 3$$
$$x_1 + x_2 \geq 2$$
$$x_i \geq 0$$

(11 Marks)

Module-2

3 a. Define Slack variable, Surplus variable and Artificial variable. **(06 Marks)**

b. For the LPP,

Maximize $Z = 2x_1 - 5x_2 + 10x_3$

Subject to $x_1 + 2x_2 + 2x_3 \leq 90$

$x_1, x_2, x_3 \geq 0$

i) Find all basic solutions and obtain optimum solution.
ii) Find the optimum solution by simplex.
iii) Write the dual for the given LPP. **(10 Marks)**

OR

4 Solve the following LPP

Maximize $Z = x_1 + 2x_2 + 3x_3$

Subject to $x_1 - x_2 + x_3 \geq 4$

$$x_1 + x_2 + 2x_3 \leq 8$$
$$x_1 - x_3 \geq 2$$
$$x_1, x_2, x_3 \geq 0$$

(16 Marks)

Module-3

5 a. What is degeneracy in transportation problem? Discuss its consequence and how it is over come. **(04 Marks)**

b. Obtain the optimum solution to the following transportation problem to minimize the total transportation cost. Initial solution by Vogel's approximation method. (VAM).

		Destination				
		D_1	D_2	D_3	D_4	Supply
Origin	O_1	42	48	38	37	16
	O_2	40	49	52	51	15
	O_3	39	38	40	43	19
Demand		8	9	11	16	

(12 Marks)

OR

6 a. Explain the differences between assignment problem and transportation problem. **(05 Marks)**

b. A small machine shop has five jobs to be assigned to five machines. The following matrix indicates the cost of assigning each of the five jobs to each of the five machines. Obtain the optimum assignment of jobs to machines, in order to minimize the total assignment cost.

		Machines				
		1	2	3	4	5
Jobs	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

Q6(b) Cost Matrix

(11 Marks)

Module-4

7 a. Explain the Fulkerson's rule for number of nodes. **(05 Marks)**

b. Time estimates in weeks for PERT net work is given below. Calculate the following:

(i) Total expected time for the critical path

(ii) Standard deviation and varience for the project

(iii) Probability of project completion atleast 4 weeks earlier than expected time

(iv) If the project due date is 19 weeks, what is the probability of not meeting the due date?

Activity	t_o	t_m	t_p
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15

(11 Marks)

OR

8 a. Explain the queuing system description parameters. **(05 Marks)**

b. A TV repairman finds that the time spent on his jobs has an exponential distribution, with mean 30 minutes. If he repairs set in the order in which they come in and if the arrival of sets is approximately Poisson with an average rate of 10/8 hrs day, what is repairman's expected idle time each day. How many jobs are ahead of average set just brought in? **(11 Marks)**

Module-5

9 a. Define Saddle point, Zero Sum game, Game Value. **(06 Marks)**

b. Reduce the game to either m × 2 or 2 × n by dominance, and then solve graphically.

A \ B	B_1	B_2	B_3	B_4
A_1	19	6	7	5
A_2	7	3	14	6
A_3	12	8	18	4
A_4	8	7	13	–1

(10 Marks)

OR

10 a. State assumptions made while applying Johnson's rule to 'n jobs on 2 machines'. **(06 Marks)**

b. Use graphical method to minimize the time required to process the following jobs on the machines. For each machine specify the job which should be done first. Also calculate the total elapsed time.

Job 1	Sequence	A	B	C	D	E
	Time (hr)	6	8	4	12	4
Job2	Sequence	B	C	A	D	E
	Time (hr)	10	8	6	4	12

(10 Marks)

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