CBCS SCHEME

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

17ME81

Eighth Semester B.E. Degree Examination, June/July 2023
Operations Research

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of Normal distribution tables is permitted.***

Module-1

1 a. What are various phases of OR problem? Explain them briefly. **(06 Marks)**

b. The standard weight of the brick is 5 kg and it contains two basic ingredients B_1 and B_2. B_1 costs Rs. 5/kg and B_2 costs Rs.8 per kg. Strength considerations dictate that the brick contains not more than 4 kg of B_1 and a minimum of 2 kg of B_2. Since the demand for the brick is likely to be related to the price of brick. Find the minimum cost of brick. Solve graphically. **(14 Marks)**

OR

2 a. Define: (i) Feasible solution (ii) Optimum solution
(iii) Redundant constraint (iv) Alternate solution. **(06 Marks)**

b. Old hens can be brought at Rs. 50 each and young hens can be brought at Rs.100 each. The old hens lay 3 eggs / week and young hens 5 eggs/week. Each egg cost Rs.2. A hen cost Rs.5 per week to feed, if a person has only Rs.2000 to spend on hens, formulate the problem to decide how many of each kind of hens should he buy? And he cannot house more than 40 hens, formulate the problem as LPP and solve graphically. **(14 Marks)**

Module-2

3 Solve the following LPP using Simplex method.

$$Z_{max} = 3x_1 + 2x_2$$

Subject to $2x_1 + x_2 \le 40$

$x_1 + x_2 \le 24$

$2x_1 + 3x_2 \le 60$

$x_1, x_2 \ge 0$. **(20 Marks)**

OR

4 a. Define : (i) Slack variable (ii) Surplus variable (iii) Artificial variable
(iv) Unbounded solution (v) Inconsistancy **(10 Marks)**

b. Write the dual for the following primal:

$$Z_{min} = 2x_1 + 3x_2 + 4x_3$$

Subject to, $2x_1 + 3x_2 + 5x_3 \ge 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \le 5$.

$x_1, x_2 \ge 0$, x_3 is unrestricted in sign. **(06 Marks)**

c. Write a brief note on " Degeneracy in Simplex method". **(04 Marks)**

Module-3

5 Determine the optimum transportation schedule for the transportation problem given in table.

Ware house / Factory	W_1	W_2	W_3	W_4	Supply
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Demand	5	8	7	14	

(20 Marks)

OR

6 a. Write a brief note on 'Degeneracy in Transportation problem'. **(06 Marks)**

b. Solve the following assignment problem. A owner of a machine shop has four operators and five jobs to assign. Expected profit for Job and Operator combination is given below.

OPERATORS	JOBS →				
	A	B	C	D	E
1	62	78	50	101	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

(14 Marks)

Module-4

7 A project consist of seven activities for which the three time estimates are given below along with preceding activity.

(i) Draw project network.

(ii) Find critical path and project duration.

(iii) What is the probability of completing the project in 50 days?

Activity	Preceding Activity	Optimistic Time	Most likely time	Pessimistic time
A	-	4	6	8
B	A	8	10	12
C	A	12	18	24
D	B	9	9	9
E	C	10	14	18
F	A	5	5	5
G	D, E, F	8	10	12

(20 Marks)

OR

8 a. Briefly explain queing system and its characteristics. **(08 Marks)**

b. A self service store employs one cashier at its counter 9 customers arrive on an average every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming Poisson probability distribution for arrival rate and exponential distribution for service rate. Find

(i) Average number of customer in system

(ii) Average number of customer in que

(iii) Average time customer spend in system.

(iv) Average time customer waits before service.

(v) What proportion of time cashier is busy and idle? **(12 Marks)**

Module-5

9 a. Define the following:
- (i) Pay off matrix.
- (ii) Pure strategy and Mixed strategy.
- (iii) Fair game.
- (iv) Dominance rule.
- (v) Minimax and Maximin principle.

(10 Marks)

b. Solve the following game using dominance rule :

		Player B			
		1	2	3	4
Player A	1	3	2	4	0
	2	3	4	2	4
	3	4	2	4	0
	4	0	4	0	8

(10 Marks)

OR

10 a. List the assumptions made while dealing with sequencing problem. (05 Marks)

b. Five jobs are to be processed on 3 machines, A, B and C in the order ABC. Determine a sequence for Job that will minimize the total elapsed time and idle time for each machine.

Job	1	2	3	4	5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

(15 Marks)

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