

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA INTEGRATED- SEMESTER- 4 EXAMINATION – WINTER - 2022

Subject Code: 2648602**Date: 19/12/ 2022****Subject Name: Operations Research****Time: 10:30 AM TO 1:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** What is Operation Research? Explain features and application of OR. **07**
(b) What is Linear Programming? Explain the basic components of an LP model. Also state its assumptions. **07**

- Q.2 (a)** Construct the dual of the problem. **07**
 Maximize $Z=3X_1+5X_2$
 Subject to Constraints,
 $6X_1+6X_2 \leq 55,$
 $8X_1+2X_2 \leq 30,$
 $5X_1-3X_2 \leq 18,$
 $X_2 \leq 28$
 Where $X_1 \geq 0, X_2 \geq 0.$
- (b)** Use the graphical method to solve the following LP problem **07**
 Minimize $Z=20X_1+10X_2$
 Subject to constraints,
 $X_1+2X_2 \leq 40,$
 $3 X_1+ X_2 \geq 30,$
 $4 X_1+3 X_2 \geq 60,$
 And $X_1, X_2 \geq 0.$

OR

- (b)** Use the simplex method to find the optimal solutions of the following LP Problem. **07**
 Maximize $z =5x_1+3x_2$
 $x_1+2x_2 \leq 10,$
 $x_1-2x_2 \leq 8,$
 And $x_1, x_2 \geq 0.$

- Q.3 (a)** Solve the assignment problem At the head office of a company there are five registration counters. Five persons are available for service. How should the counters be assigned to persons so as to maximize the profit? **07**

Person	A	B	C	D	E
Counter					
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

- (b)** Discuss the various types of inventories in detail. **07**

OR

- Q.3 (a)** The production department for a company requires 4000 kg of raw material for manufacturing a particular item per year. The cost of placing an order is Rs. 40 and the cost of carrying inventory is 25% of the investment of the inventories. The purchase price is Rs. 10per kg. Determine the ordering policy for the purchase of raw material. **07**
(b) Find the Initial basic feasible solution to the following transportation problem using **07**

Vogel's Approximation.

		Destination				Supply
		D1	D2	D3	D4	
Source	O1	3	1	7	4	300
	O2	2	6	5	9	400
	O3	8	3	3	2	500
Demand		250	350	400	200	1200

- Q.4 (a)** The cost of a machine is Rs.6100 and its scrap value is Rs.100. The maintenance costs found from experience are as follows: **07**

Year	1	2	3	4	5	6	7	8
Maintenance cost(Rs)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

- (b)** A super market has a single cashier. During the peak hours, customers arrive at a rate of 20 customers per hour. The average no of customers that can be processed by the cashier is 24 per hour. Find **07**
- The probability that the cashier is idle.
 - The average no of customers in the queue system.
 - The average time a customer spends in the system.
 - The average time a customer spends in queue.
 - The any time a customer spends in the queue waiting for service.

OR

- Q.4 (a)** Solve the payoff matrix. Determine the best strategies for players A and B and the value of the game. **07**

		B's Strategy				
		B1	B2	B3	B4	B5
A's Strategy	A1	8	10	-3	-8	-12
	A2	3	6	0	6	12
	A3	7	5	-2	-8	17
	A4	-11	12	-10	10	20
	A5	-7	0	0	6	2

- (b)** Define: Simulation. State the advantages and disadvantages of simulation. **07**

- Q.5 (a)** Explain the difference between PERT and CPM. **07**

- (b)** There are four jobs to be completed. Each job must go through machines M1, M2, M3 in the order M1 – M2 – M3. Processing time in hours is given below. Determine the minimum elapsed time and idle time for Machine M1. **07**

JOBS	A	B	C	D
M1	5	8	7	3
M2	6	7	2	5
M3	7	8	10	9

OR

- Q.5 (a)** A small project is composed of seven activities as given below: **07**

Activity	A	B	C	D	E	F	G
Preceding Activity	---	---	A	A,B	C,D	E	C,D
to (days)	2	3	5	4	5	2	3
tm (days)	4	5	7	7	9	4	6
tp (days)	6	7	9	10	14	6	9

- Draw project network
 - Find Critical Path, Expected duration, standard deviation and variance of all activities.
- (b)** What is the main objective of sequencing problem? State the assumptions generally made while dealing with sequencing problems. **07**
