Reg. No.															

Question Paper Code	13784

MBA - DEGREE EXAMINATIONS, APRIL / MAY 2025

First Semester

Master of Business Administration

20MBT205 / 24MBT205 - BUSINESS OPTIMIZATION TECHNIQUES

Regulations – 2020 / 2024

(Use of *Graphs* is permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Write the mathematical form of LPP?	2	K1	CO1
2.	Write the dual of the following primal problem: Maximize $Z = 4x_1 + 5x_2$ Subject to $5x_1 + 2x_2 \leq 20$ $7x_1 + 6x_2 \leq 30$ $x_1 \geq 0\,,\ x_2 \geq 0$	2	K2	CO1
3.	Explain how maximization problems are solved in the assignment model.	2	K2	CO2
4.	What is meant by balanced and unbalanced Transportation Problem?	2	K1	CO2
5.	Define total elapsed time in sequencing model.	2	K1	CO3
6.	Test whether the following game is fair or strictly determinable.	2	K2	CO3

	Player B				
Player A	3	-1	4	6	7
	-1	8	2	4	12
	16	8	6	14	12
	1	11	-4	2	1

7.	The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges are 25% per annum. If the cost of the procurement is Rs.150, determine economic order quantity.	2	K2	CO4
8.	List the types of decision making situations.	2	K1	CO4
9.	Explain Group replacement.	2	K2	CO5
10.	What are the characteristics of a queuing system?	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Solve the following LPP by graphical method. Minimize $Z = 20x_1 + 10x_2$ Subject to $x_1 + 2x_2 \leq 40$ $3x_1 + x_2 \geq 30$ $4x_1 + 3x_2 \geq 60$ and $x_1 \geq 0\,,\ x_2 \geq 0.$	13	K3	CO1

OR

b) Solve the following LPP by Simplex method. *13 K3 CO1*

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to

$$x_1 + 2x_2 + x_3 \leq 430$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 4x_2 \leq 420$$

and $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$.

12. a) Determine the optimal solution of the following transportation problem. *13 K3 CO2*

	A	**B**	**C**	**D**	**Supply**
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Demand	6	10	12	15	

OR

b) Solve the following Travelling Salesman Problem. *13 K3 CO2*

From City

To City	**A**	**B**	**C**	**D**
A	-	3	8	5
B	4	-	14	3
C	5	5	-	2
D	7	8	13	-

13. a) Solve the following game by Dominance method. *13 K3 CO3*

Player B

Player A				
	3	2	4	0
	3	4	2	4
	4	2	4	0
	0	4	0	8

OR

b) Solve the following game by graphical method. *13 K3 CO3*

Player B

Player A					
	3	0	6	-1	7
	-1	5	-2	2	1

14. a) Find the optimum order quantity for a product where the monthly demand for the product is 400 units. The cost of storage per unit is 20% of the unit cost per month and ordering cost per order is Rs.25. The unit costs are given below. *13 K3 CO4*

Quantity	Unit cost (Rs.)
$0 \leq q < 100$	Rs.20
$100 \leq q < 200$	Rs.18
$200 \leq q$	Rs.16

OR

b) A company has a demand of 12,000 units/year for an item and it can produce 2000 units items per month. The cost of one setup is Rs.400 and the holding cost /unit /month is Re. 0.15. The shortage cost per unit is Rs. 20 per year. Find the optimum lost size and the total cost per year, assuming the cost of 1 unit is Rs. 4. Also find the maximum inventory, manufacturing time and total units to be produced. *13 K3 CO4*

15. a) Customers arrive at a one-man barber-shop according to a Poisson process with mean inter-arrival time of 20 minutes. Customers spend an average of 15 minutes in the barber's chair. If service time follows exponential distribution, an hour is used as unit of time, then *13 K3 CO5*
(i) What is the probability that a customer need not wait for a haircut?
(ii)
What is the expected number of customers in the barber's shop and in the queue?
(iii) How much time can a customer expect to spend in the barber shop?
(iv) Find the average time that the customer spend in the queue?
(v) What is the probability that there will be more than 3 customers in the system?

OR

b) The following failure rates have been observed for certain items. *13 K3 CO5*

End of month	1	2	3	4	5
Probability of failure	0.10	0.30	0.55	0.85	1.00

The cost of replacing an individual item is Rs 1.25. The decision is made to replace all items simultaneously at fixed intervals and also replace individual items as they fail. If the cost of group replacement is 50 paisa, what is the best interval for group replacement? Which is better group replacement or Individual replacement?

PART - C (1× 15 = 15 Marks)
(Compulsory)

16. a) There are five jobs, each of which is to be processed through three machines A, B, C in the order with processing times in hours are as follows: *15 K3 CO6*

Job	**1**	**2**	**3**	**4**	**5**
Machine - 1	3	8	7	5	4
Machine - 2	4	5	1	2	3
Machine - 3	7	9	5	6	10

Find the total elapsed time and waiting time of machines.