Reg. No.															

Question Paper Code	13307

MBA - DEGREE EXAMINATIONS, NOV / DEC 2024

Second Semester

Master of Business Administration

20MBT205 - BUSINESS OPTIMIZATION TECHNIQUES

Regulations - 2020

(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.	What are the Slack and Surplus variables?	2	K1	CO1
2.	Write the dual of the following primal problem: Maximize $Z = 4x_1 + 5x_2$ Subject to, $5x_1 + 2x_2 \leq 20$, $7x_1 + 6x_2 \leq 30$ and $x_1 \geq 0\,, x_2 \geq 0$.	2	K1	CO1
3.	What is unbalanced transportation problem?	2	K1	CO2
4.	Distinguish: Travelling salesman problem and assignment problem.	2	K2	CO2
5.	Define the terms: (i) Saddle point (ii) Two person zero sum game.	2	K1	CO3
6.	What is the objective of sequencing problem?	2	K1	CO3
7.	Explain the following terms in inventory management: (i) Holding cost (ii) Shortage cost (iii) Ordering cost	2	K1	CO4
8.	Calculate the EOQ in units for an item A whose ordering cost is Rs. 5, Unit price is Re. 1, holding cost is 10% of the cost of the item, annual demand is 400 items and shortage cost is not allowed?	2	K2	CO4
9.	Define Kendal's Notation for representing Queuing models.	2	K1	CO5
10.	Discuss the various types of replacement problems.	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
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 $Z = 2x_1 + 5x_2$

Subject to,

$x_1 + 4x_2 \leq 24$,

$3x_1 + x_2 \leq 21$,

$x_1 + x_2 \leq 9$,

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

12. a) Five wagons are available at stations 1, 2, 3, 4 and 5. These are required at five stations *I, II, III, IV* and *V*. The mileages between various stations are given by the table below. How should the wagons be transported so as to minimize the total mileage covered? *13 K3 CO2*

		Machines				
		I	*II*	*III*	*IV*	*V*
Stations	1	10	5	9	18	11
	2	13	9	6	12	14
	3	3	2	4	4	5
	4	18	9	12	17	15
	5	11	6	14	19	10

OR

b) In the modification of a plant layout of a factory four new machines M_1, M_2, M_3 and M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M_2 cannot be placed at C and M_3 cannot be placed at A. The cost of locating a machine at a place (in hundreds of rupees) is as follows. *13 K3 CO2*

		Location				
		A	B	C	D	E
Machine	M_1	32	38	40	28	40
	M_2	40	24	28	21	36
	M_3	41	27	33	30	37
	M_4	22	38	41	36	36

How should the job be assigned to machines so that the total cost is minimized?

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

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

OR

b) Find Solution of game theory problem using dominance method. *13 K3 CO3*

Player A\Player B	B1	B2	B3	B4
A1	3	5	4	2
A2	5	6	2	4
A3	2	1	4	0
A4	3	3	5	2

14. a) Demand for an item in a company is 18,000 units per year. The company can produce the items at a rate of 3000 units per month. The cost of one setup is Rs.500 and the holding cost of one unit per month is 15 paise. Shortage cost of one unit is Rs.20 per year. *13 K3 CO4*
(i) Find the optimum manufacturing quantity.
(ii) Find the number of shortages and frequency of production run.

OR

b) Find the optimal order quantity for a product for which the price breaks are as follows *13 K3 CO4*

Quantity	Unit cost (Rs.)
$0 < q < 500$	Rs.10
$500 \leq q < 750$	Rs.9.25
$750 \leq q$	Rs.8.75

The monthly demand for the product is 200 units, storage cost is 2% of the unit cost and cost of ordering is Rs.100

15. a) In a super market, the average arrival rate of customer is 10 in every 30 minutes following Poisson process. The average time taken by the cashier to list and calculate the customer's purchases is 2.5 minutes, following exponential distribution. What is the probability that the queue length exceeds 6 and what is the expected time spent by a customer in the system? *13 K3 CO5*

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 paise, what is the best interval for group replacement? At what group replacement per item, would a policy of strictly individual replacement become preferable to the adopted policy.

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

16. A machine operator has to perform two operations, turning and threading on a number of different jobs. The time required to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs. *15 K3 CO3*

Job	Time for Turning (minutes)	Time for threading (minutes)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

Also find the total processing time and idle times for turning and threading operations.