

QP CODE: 22001610



Reg No : .....

Name : .....

**M COM DEGREE (CSS) EXAMINATION, JULY 2022**

**First Semester**

**CORE - CM010104 - MANAGEMENT OPTIMISATION TECHNIQUES**

M.COM FINANCE AND TAXATION, M.COM FINANCE AND TAXATION (SF), M.COM MARKETING AND INTERNATIONAL BUSINESS (SF), M.COM MANAGEMENT AND INFORMATION TECHNOLOGY (SF), Master of Commerce and Management

2019 ADMISSION ONWARDS

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Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)**

*Answer any eight questions.*

*Weight 1 each.*

1. Define operations research.
2. Write a note on validation of operations research model.
3. Convert the following LPP into standard form.

Maximize  $Z = 6X_1 + 4X_2$

Subject to the constraints

$$X_1 + 2x_2 \leq 720$$

$$2x_1 + x_2 \leq 780$$

$$X_1 \leq 320$$

$$X_1, X_2 \geq 0$$

4. Vitamins E and C are found in foods A and B. One unit of food A contains 5 units of vitamin E and 3 units of vitamin C. One unit of food B contains 5 units of vitamin E and 4 units of vitamin C. One unit of A and B cost Rs. 7 and Rs. 8 respectively. The minimum daily requirement of vitamin A and B is 100 and 120 units respectively. Assuming that anything in excess of minimum requirement of vitamin A and B is not harmful, find out the optimum mixture of food A and B at the minimum cost which meets the daily minimum requirement of vitamins A and B. Formulate this as a linear programming problem.
5. Write a short note on LCM.
6. Determine initial feasible solution to the following transportation problem by using NWCM

Source Destination Supply

**D1 D2 D3 D4**

**S1 21 16 15 3 11**

**S2 17 18 14 23 13**

**S3 32 27 18 41 19**

Demand **6 10 12 15**





7. Give a brief note on 'Maximax Criterion'.
8. A firm is using a machine whose purchase price is Rs 13,000. The installation charges amount to Rs 3600 and the machine has a scrap value of only Rs 1600 because the firm has a monopoly of this type of work. The maintainace cost in various years is given in the following table.

Year:	1	2	3	4	5	6	7	8	9
Cost Rs:	250	750	1000	1500	2100	2900	4000	4800	6000

The firm wants to determine after how many years the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year ends.

9. State the objectives of PERT.
10. Draw the following logic network: Activities C and D both follow A; Activity E follows C; Activity F follows D; E and F precedes B.

(8×1=8 weightage)

### Part B (Short Essay/Problems)

Answer any **six** questions.

Weight 2 each.

11. State three operations research models which have wide commercial applications.
12. Explain the steps involved in graphic method of solving LP problems.
13. A company has three operational departmements(weaving, processing and packing). With capacity to produce three different types of clothes namely suitings, shirtings and woollens yeilding the profit of Rs.2, Rs.4 and Rs. 3 per metre respectively. 1 metre suiting requires 3 minutes in weaving 2 minutes in processing and 1 minute in packiing similarly 1 metre of shirting requires 4 minutes in weaving 1 minute in processing and 3 minutes in packing while 1 metre woollen requires 3 minutes in each department. In a week total run times of each department are 60, 40 and 80 hours of weaving , processing and packing departments respectively. Formulate the linear programming problem and solve using graphical method.
14. Find the initial basic feasible solution for the transportation problem using VAM.

Plants	Distribution Centres					Supply
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	
O <sub>1</sub>	3	5	8	9	11	20
O <sub>2</sub>	5	4	10	7	10	40
O <sub>3</sub>	2	5	8	7	5	30
Requirement	10	15	25	30	40	

15. A company has to assign four workers A,B,C and D to do four jobs W,X,Y and Z The cost matix is given below Suggest and optimal assignment schedule the total cost pertaining thereto;

	W	X	Y	Z
A	1000	1200	400	700
B	600	500	300	800
C	200	300	400	500
D	600	700	300	1000





16. A factory produces 3 varieties of fountain pens. The fixed and variable costs are given below

Type	Fixed Cost	Variable Cost
I	200000	10
II	320000	8
III	600000	6

The likely demands under three situations are given as Poor- 25000, Moderate - 100000, High- 150000. If the price of each type is Rs 20, Prepare the pay off table after showing necessary calculations.

17. Apply the rule of dominance and solve the following problem.

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	6	8	3	13
A <sub>2</sub>	4	1	5	3
A <sub>3</sub>	8	10	4	12
A <sub>4</sub>	3	2	7	2

18. A publisher has a contract with an author to publish a text book. The (simplified) activities associated with the production of the textbook are given subsequently. Develop an associated network for the project:

Activity	A	B	C	D	E	F	G	H	I	J
Preceding Activity	-	-	-	A,B	E	F	D	G,H	C,I	

(6×2=12 weightage)

### Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Solve the following LP problem using simplex method,

$$\text{Maximize } Z = 4x_1 + 3x_2$$

Subject to,

$$200x_1 + 100x_2 \geq 4000$$

$$x_1 + 2x_2 \geq 50$$

$$40x_1 + 40x_2 \geq 1400$$

$$x_1, x_2 \geq 0$$

20. 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?

	I	II	III	IV	V
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

21. a) The following mortality rates have been observed for certain type of light bulbs:

Week	1	2	3	4	5
% age failing by the end of week	10	25	50	80	100





There are 1000 bulbs in use and it costs Rs 5 to replace an individual bulb which has burnt out. If all the bulbs are replaced simultaneously it would cost Rs 2 per bulbs. It is proposed to replace all bulbs at fixed intervals, whether they have burnt out or not and to continue replacing burnt out bulbs as and when they fail. At what intervals should all the bulbs be replaced?

b) Solve the following game by sub game technique;

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>
A <sub>1</sub>	-5	5	0	-1	8
A <sub>2</sub>	8	-4	-1	6	-5

22. The sequence of activities together with their predecessors relating to project is given below. Draw a network diagram for the project.

Activity	A	B	C	D	E	F	G	H	I	
Predecessors	-	A	A	B	B	C	E	D,F	G,H	
Estimated Time( Days)	Optimistic	4	5	4	15	10	8	4	1	6
	Most Likely	6	7	8	20	18	9	8	2	7
	Pessimistic	8	15	12	25	26	16	12	3	8

Determine the critical path and compute the expected project completion time.

(2×5=10 weightage)

