

QP CODE: 1618



Reg No :

Name :

M.Com DEGREE (CSS) PRIVATE EXAMINATION, NOVEMBER 2022

First Semester

COMMERCE

CORE - CM010104 - MANAGEMENT OPTIMISATION TECHNIQUES

2019 ADMISSION ONWARDS

D9750F1D

Time: 3 Hours

Weightage: 30

Instructions (Applicable for 2020 & 2021 Admissions only) : This question paper contains two sections. Answer section I questions in the answer book provided. Section II Internal examination questions must be answered in the question paper itself. Follow the detailed instructions given under section II.

SECTION I

Part A (Short Answer Questions)

Answer any **eight** questions.

Weight **1** each.

1. Define operations research as a decision making science.
2. Elaborate the wholistic approach characteristic of operations research.
3. Convert the constraints into equations
Maximize $Z = 2x_1 + 3x_2 + 4x_3$
Subject to,
$$3x_1 + x_2 + 6x_3 \leq 600$$
$$2x_1 + 4x_2 + 2x_3 \geq 480$$
$$2x_1 + 3x_2 + 3x_3 = 540$$
$$x_1, x_2, x_3 \geq 0$$
4. A company produces two types of cow-boy hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second types to 150 and 250 hats. Assuming that the profits per hat are Rs. 8 for type 1 and Rs. 5 for type 2, formulate the problem as a L.P. model to determine the number of hats to be produced of each type so as to maximize the profit.
5. Write a short note on NWCM.



6. Write a short note on unbalanced assignment problem.

7. List the components of a decision problem.

8. Solve the following game;

A	B		
	B ₁	B ₂	B ₃
A ₁	60	56	34
A ₂	63	60	55
A ₃	83	72	60

9. Explain the merits of CPM.

10. Draw a network using the following precedence relationship: Activity A- Nil, B- Nil, C-A, D-A, E-B, F-B, G-C&E, H- C, E & F

(8×1=8 weightage)

Part B (Short Essay/Problems)

Answer any **six** questions.

Weight **2** each.

11. Quantifying the elements of a decision problem is the easy part; the hard part is solving the model. Do you agree? Why or why not?

12. Explain the limitations of linear programming.

13. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients B₁ and B₂. B₁ costs Rs. 5/kg and B₂ costs Rs. 8/kg. Strength considerations dictate that the brick contains not more than 4 kg of B₁ and a minimum of 2 kg of B₂. Since the demand for the product is likely to be related to the price of the brick, find out graphically the minimum cost of the brick satisfying the above conditions.

14. Solve the following transportation problem using Vogel's approximation method

	1	2	3	4	Capacity
A	7	8	11	10	30
B	10	12	5	4	45
C	6	11	10	9	55

Required 20 28 19 33

15. Solve the following assignment problem of minimizing total time for doing all the jobs;

Operators	Job				
	I	II	III	IV	V
A	6	2	5	3	6

B	2	5	8	7	7
C	7	8	6	9	8
D	6	2	3	4	5
E	9	3	8	9	7
F	4	7	4	6	8

16. Explain briefly the various decision making situations.

17. Solve the following 2 x 2 game by probability method.

	B ₁	B ₂
A ₁	8	5
A ₂	2	6

18. Explain the different types of floats in network analysis.

(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,

$$\text{Maximize } Z = 3x_1 + 2x_2 + 5x_3$$

Subject to,

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_3 \leq 420$$

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

20. A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below.

Salesmen	Districts				
		1	2	3	4
	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

Find the assignment of salesmen to various districts which will yield maximum profit.



21. a) The following mortality rate has been observed for a certain type of electric bulb:

Week	1	2	3	4	5	6	7	8
Prob. of failure by the weekend	0.00	0.13	0.25	0.43	0.68	0.88	0.96	1.00

The cost of replacing an individual failed bulb is Rs. 14.60. It has been decided that all bulbs are replaced simultaneously at fixed intervals and also to replace individual bulbs as they fail in service . If the cost of group replacement is Rs. 4.60 per bulb, what is the optimal interval between two group replacments.

- b) Solve the following using sub game technique;

	B ₁	B ₂
A ₁	2	5
A ₂	2	3
A ₃	3	2
A ₄	-2	8

22.

The following table gives the activities and other relevant data for a project
Indirect cost is Rs.200 per day for the project.

Activity		1-2	1-3	1-4	2-3	2-5	3-5	4-5
Time(days)	Normal	4	2	5	7	7	2	5
	Crash	3	2	4	5	6	1	4
Cost (Rs.)	Normal	600	400	750	400	800	500	600
	Crash	800	400	900	600	1,000	650	850

1. Draw the network diagram.
2. Find the critical path and its duration.
3. Find the optimum duration and resultant cost of the project.

(2×5=10 weightage)