



QP CODE: 21002195

Reg No :

Name :

M COM DEGREE (CSS) EXAMINATION, NOVEMBER 2021

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

DCA6FDF9

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write briefly about Iconic models, Analogue models and Mathematical models.
2. Elaborate the wholistic approach characteristic of operations research.
3. An animal feed company must produce 200 kg of a mixture consisting of ingredients x_1 and x_2 . The ingredient x_1 costs Rs. 3 per kg and x_2 costs Rs. 5 per kg. No more than 80 kg of x_1 can be used and at least 60 kg of x_2 must be used. Formulate the model to minimize the cost of the mixture.
4. Formulate the dual of the following primal problem.
Maximize $Z = 6x_1 + 4x_2$
Subject to the constraints
$$x_1 + 2x_2 \leq 720$$
$$2x_1 + x_2 \leq 780$$
$$x_1 \leq 320$$
$$x_1, x_2 \geq 0$$
5. Write a short note on feasible solution, basic feasible solution and optimum solution in a transportation problem.
6. Write a short note on prohibited assignment.
7. List the components of a decision problem.
8. What do you mean by group replacement?
9. What do you mean by earliest start time? How do you calculate it?

10. Draw the network for the project consisting of eleven activities with constraints determined as under:

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Predecessors	-	A	A	A	B	C	C	D	E	F	G,H	I,J,K

(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. The ABC company wishes to plan its advertising strategy. There are two media under consideration, call them magazine I and II respectively. Magazine I has a reach of 2,000 potential customers and magazine II has reach of 2,500 potential customers. The cost per page of advertising is Rs. 400 and Rs. 600 in magazines I and II respectively. The company has a monthly budget of Rs. 6,000. There is an important requirement that the total reach for the income group under Rs. 20,000 per annum should not exceed 4,000 potential customers. The reach in magazines I and II for this income is 400 and 200 potential customers per advertisement. How many pages should be bought in the two magazines to maximize the total reach? Formulate this as a LPP and convert the LPP into standard form.
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. Distinguish between transportation problem and assignment problem.
15. Find the initial basic feasible solution for the transportation problem using VAM.

Factories	Warehouses				Availability
	I	II	III	IV	
A	10	8	7	12	500
B	12	13	6	10	500
C	8	10	12	14	900
Demand	700	550	450	300	

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	2	5
A ₂	4	1

18. Listed in the table are the activities and sequencing necessary for a maintenance job on the heat exchangers in a refinery:

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

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. A fertiliser is marketed in polythene bags weighing at least 80 kg. Each bag of fertiliser consists of a mixture of two ingredients-nitrate and phosphate. The cost of nitrate is Rs. 40/- per kg and the cost of phosphate is Rs. 25/- per kg. Every bag must contain at least 1,500 gm of ammonia. The ammonia content in 1 kg of nitrate is 20gm and in 1 kg of phosphate is 12 gm. Determine the optimum mix of phosphate and nitrate in a bag of fertiliser that will minimise the total cost.

20. Solve the following assignment problem:

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

21. I) Apply the rule of dominance and solve the following problem.

	B ₁	B ₂	B ₃	B ₄	B ₅	B ₆
A ₁	0	0	0	0	0	0
A ₂	4	2	0	2	1	1
A ₃	4	3	1	3	2	2
A ₄	4	3	7	-5	1	2
A ₅	4	3	4	-1	2	2
A ₆	4	3	3	-2	2	2

II) A machine X costs Rs 5000. The maintenance cost is Rs 1000 in the first four years and then it increases by Rs 200 in each successive years. Another machine Y costs Rs 8000 whose maintenance cost is Rs 200 in the first year which increases by Rs 400 in every succeeding year. Assuming

- Both the machines have no salvage value
- That the time value of money is 10% p.a.
- Maintenance and operating costs are incurred in the beginning of each year.

Find out what is optimal replacement time for machine X and machine Y and which should be preferred?

22. A project has following information regarding the activities relation among them and time of completion of each activity.

Determine the critical path and minimum time for the completion of the project.

Activity	A	B	C	D	E	F	G	H	I
Predecessors	-	A	B	B	C	D	C	E,F	G,F
Duration (Days)	5	7	2	3	1	2	1	3	10

(2×5=10 weightage)