

**M.Com DEGREE (CSS) PRIVATE EXAMINATION, NOVEMBER 2023****First Semester**

Faculty of Commerce

COMMERCE

CORE - CM010104 - MANAGEMENT OPTIMISATION TECHNIQUES

2019 ADMISSION ONWARDS

B65CF438

Time: 3 Hours

Weightage: 30

Instructions: (Applicable for 2020 Admission Onwards) 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. Give a brief account on analytical and iterative methods for solving operations research models.
3. Write the standard form of the following LPP.

Maximize $Z = 9x_1 + 3x_2$

Subject to,

$$2x_1 + 3x_2 \leq 13$$

$$2x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

4. Obtain the dual of:

Maximize $Z = 20x_1 + 6x_2 + 8x_3$

Subject to,

$$8x_1 + 2x_2 + 3x_3 \leq 250$$


$$4x_1 + 3x_2 \leq 150$$

$$2x_1 + x_3 \leq 50$$

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

5. Explain any four application of transportation problem.



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6. Write a short note on unbalanced transportation problem.
 7. Write note on EMV approach.
 8. What do you mean by individual replacement?
 9. Write a note on PERT.
 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. Briefly describe the scope of Operations Research.
12. Write a note on 1) Infeasible Solution, 2) Unbounded Solution, 3) Redundancy, 4) Multiple optimal solutions in LPP
13. XYZ engineering Ltd. had obtained a large contract for the supply of an alloy steel. The alloy makes three metals X, Y and Z. The minimum requirements of the metals per week would be : 12 units of X, 10 units of Y and 14 units of Z. The metals are available from the dealers who are called by code numbers 121, 321, and 115 respectively. Box 121 contains 1 unit of X, 2 units of Y and 1 unit of Z. Box 321 contains 3 units of X, 2 units of Y and 1 unit of Z. Whereas box 115 contains 1 unit each of X and Y and 5 unit of Z. one box of type 121, 321, and 115 costs Rs.1200 Rs.900 and Rs.1500 respectively.
Formulate it as a linear programming problem to determine the number of boxes of each kind to be bought per week so as to acquire the required amounts of X Y and Z at a minimum cost. Also obtain the dual for the primal problem.
14. Explain the procedure for testing optimality of transportation problem.
15. Find the initial basic feasible solution for the transportation problem using VAM.

Factories	Warehouses				Availability
	I	II	III	IV	
A	5	3	4	2	100
B	1	6	7	10	100
C	3	2	1	5	100
D	8	10	9	3	150
Demand	100	100	100	100	

16. Given below is a pay off table;

Events	Acts		
	A1	A2	A3
E1	5	-1	-17

E2	18	28	30
E3	25	50	80

What will be the optimum decision if the criterion followed is (1) Maximax (2) Minimax (3) Maximin (4) Laplace (5) EMV (6) EOL.
Given probabilities for various events are 0.3, 0.4 and 0.3 respectively.

17. Explain the different types of replacement problems.

18. Explain the uses of floats in CPM network.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight **5** each.

19. A manufacturing company produces two types of product: the super and the regular. Resource requirements for production are given below in the table. There are 1,600 hours of assembly worker hours available per week, 700 hours of paint time and 300 hours of inspection time. Regular customers will demand at least 1,500 units of the regular type and 90 of the super type.

Product Type	Profit Contribution (Rs.)	Assembly Time (hr.)	Paint Time (hr.)	Inspection Time (hr.)
Regular	50	1.2	0.8	0.2
Super	75	1.6	0.9	0.2

Formulate and solve the given linear programming problem to determine the product mix on a weekly basis.

20. A small aeroplane company operating seven days a week, serves three cities A, B and C according to the schedule shown in the following table. The layover cost per day is roughly proportional to the square of the layover period. How should planes be assigned the flights so as to minimize the total layover cost?

Flight No. and Cost	From	Departure	To	Arrival
A,B	A	09 A.M.	B	12 A.M.
A,B	A	10 A.M.	B	01 P.M.
A,B	A	03 P.M.	B	06 P.M.
A,C	A	08 P.M.	C	12 P.M.
A,C	A	10 P.M.	C	02 A.M.
B,A	B	04 A.M.	A	07 A.M.
B,A	B	11 A.M.	A	02 P.M.
B,A	B	03 P.M.	A	06 P.M.
C,A	C	07 A.M.	A	11 A.M.
C,A	C	03 P.M.	A	07 P.M.

21. D) A milkman buys milk at Rs 12 per litre and sells for Rs 15 per litre. Unsold milk has to be thrown away. The daily demand in litres has the following probabilistic distribution

Litres	46	48	50	52	54	56	58	60	62	64
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Prob.	.01	.03	.06	.1	0.2	0.25	0.15	0.1	0.05	0.05
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If the day's demand is independent of previous day's demand, how many litres should he order every year.

II) Machine A cost Rs 9000 .Annual operating costs are Rs 200 for the first year and then increase by Rs 2000 every year. Determine the best age at which to replace the machine. If the optimum replacement policy is followed, what will be the average yearly cost of owning and operating the machine? (Assume that the machine has no resale value when replaced and future cost are not discounted)

(b) Machine B cost Rs. 10,000. Annual operating costs are Rs.400 for the first year and then increases by Rs 800 every year. You have now a machine of Type A which is one year old. Should you replace it with B and if so when?

(c) Suppose you are just ready to replace Machine A with another machine of the same type when you hear that the machine B will become available in a year. What should you do?

22. An established company has decided to add a new product to its line. It will buy the product from a manufacturing concern, package it, and sell it to a number of distributors that have been selected on a geographical basis. The steps shown in the following table are to be planned.

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M
Predecessors	-	A	B	A	D	E	-	G	J,H	-	A	C,K	I,L
Duration (days)	6	4	7	2	4	10	2	10	6	13	9	3	5

1. Draw an arrow diagram for this project.
2. Indicate the critical path.
3. For each non-critical activity, find the total and free float.

(2×5=10 weightage)