

**M.Com. DEGREE (C.S.S ) EXAMINATION, MAY 2021****First Semester**

Faculty of Commerce

**Core - CM010104 - MANAGEMENT OPTIMISATION TECHNIQUES**

2019 Admission (For Private Candidates)

023FD508

Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)***Answer any **eight** questions.**Weight 1 each.*

- Write briefly about Iconic models, Analogue models and Mathematical models.
- Write a note on validation of operations research model.
- Write the standard form of the following problem.  
 Maximize  $Z = 3x_1 + 2x_2 + 5x_3$   
 Subject to,  
 $x_1 + 2x_2 + x_3 \leq 430$   
 $3x_1 + 2x_3 \leq 460$   
 $x_1 + 4x_3 \leq 420$   
 $x_1, x_2, x_3 \geq 0$
- State the characteristics of dual problem in linear programming.
- Find the initial basic feasible solution for the transportation problem using NWCM.

Origins	Destinations				Availability
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
P <sub>1</sub>	1	2	1	4	30
P <sub>2</sub>	3	3	2	1	50
P <sub>3</sub>	4	2	5	9	20
Requirement	20	40	30	10	

- Write a short note on unbalanced transportation problem.
- Give a brief note on 'Minimax Criterion'.
- Write a short note on Game Theory.
- Explain the merits of CPM.
- Draw the network for the project whose activities with their relationships are given below:  
 A, C, D can start simultaneously; E>B, C; F, G>D; H, I>E, F; J>I, G; K>H; B>A

(8×1=8 weightage)





Part B (Short Essay/Problems)

Answer any six questions.

Weight 2 each.

11. Write short notes on the following: ( a ) Area of applications of Operations Research ( b ) Role of constraints and objectives in the construction of mathematical models. ( c ) Statistician's role as a member of operations research team.

12. List the advantages of linear programming.

13. Convert the following LPP into standard form.

$$\text{Maximize } Z = 5x_1 + 7x_2$$

Subject to the constraints

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

$$3x_1 + 2x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

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 machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is determined by the bids submitted by each contractor and is shown below;

Subassemblies	Contractors			
	1	2	3	4
I	15	13	14	17
II	11	12	15	13
III	13	12	10	11
IV	15	17	14	16

Assign different subassemblies to contractors so as to minimize the total cost.

16. Describe the steps involved in the process of decision making.

17. Solve the following using sub game technique;

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

18. Develop a network based on the following relationships:





- I. A, B and C are the first activities of the project, can start simultaneously.
- II. A and B precede D
- III. B precede E, F and H
- IV. F and C precede G
- V. E and H precede I and J
- VI. C, D, F and J precede K
- VII. K precedes L
- VIII. I, G and L are the terminal activities of the project

(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,

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

Subject to,

$$x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_3 \leq 2$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

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

20. A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potential. It is estimated that a typical salesmen operating in each zone would bring in the following annual sales:

Zone A - Rs. 1,26,000, Zone B - Rs. 1,05,000, Zone C-Rs. 84,000, Zone D-Rs. 63,000.

The four salesmen are considered to differ in ability. It is estimated that, Working under the same condition their yearly sales would be proportionately as follows: Salesman P- 7, Salesmen Q- 5, Salesman R-5, Salesman S-4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

21. I) 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>	B <sub>5</sub>	B <sub>6</sub>
A <sub>1</sub>	0	0	0	0	0	0
A <sub>2</sub>	4	2	0	2	1	1
A <sub>3</sub>	4	3	1	3	2	2
A <sub>4</sub>	4	3	7	-5	1	2
A <sub>5</sub>	4	3	4	-1	2	2
A <sub>6</sub>	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

(i) Both the machines have no salvage value

(ii) That the time value of money is 10% p.a.

(iii) 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. Draw the network for the following project:

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Preceding activity	-	A	A	B	B	C	C	F	D	G,H	E	I
Duration (Days)	10	9	7	6	12	6	8	8	4	11	5	7

You are required to number the events by Fulkerson's rule and find the critical path.  
Also find the total float and time for completing the project.

(2×5=10 weightage)

