QP CODE: 23145556

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Reg No : .....

Name : .....

M COM DEGREE (CSS) EXAMINATION, DECEMBER 2023

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. Explain Monte Carlo Technique.
2. Elaborate the wholistic approach characteristic of operations research.
3. Write a note on pivot or key column and pivot or key row.
4. A company makes three products X, Y and Z which flow through three departments, Drill, lathe, and Assembly. The hours of department time required by each of the products, the hours available in each of the department and the profit contribution of each of the products are given in the following table:

Product	Time required per unit			Profit Contribution per unit
	Drill	Lathe	Assembly	
X	3	3	8	Rs. 9
Y	6	5	10	Rs. 15
Z	7	4	12	Rs. 20
Hours available	210	240	260	

The marketing department of the company indicates that the sales potential for the products X and Y is unlimited but for product Z is only 30 units. . Formulate this as a linear programming problem.

5. Write a short note on NWCM.
6. Write a short note on unbalanced transportation problem.
7. The maintenance cost and resale value per year of a machine whose purchase price is Rs 7000 is given below

Year	1	2	3	4	5	6	7	8
Operating Cost	900	1200	1600	2100	2800	3700	4700	5900
Resale values (Rs.)	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

8. Find the saddle point and value of the game.

	B_1	B_2	B_3	B_4
A_1	-5	3	1	20
A_2	5	5	4	6
A_3	-4	-2	0	-5

9. Give a brief notes on event, merge event, burst event and head event.

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. 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) Statician's role as a member of operations research team.

12. Explain the basic assumptions of linear programming.

13. The ABC Electric Appliance Company produces two products: refrigerators and ranges. Production takes place in two separate departments, Refrigerators are produced in department-I and ranges are produced in department-II. The company's two products are produced and sold on a weekly basis. The weekly production cannot exceed 25 refrigerators in department-I and 35 ranges in department-II, because of limited available facilities in the two departments. The company regularly employs a total of 60 workers in the two departments. A refrigerator requires 2 man-weeks of labour, while a range requires 1 man-week of labour. A refrigerator contributes a profit of Rs. 60 and a range contributes a profit of Rs. 40. Formulate the problem as L.P. problem. Find graphically how many units of refrigerators and ranges should the company produce to realise a maximum profit?

14. Obtain the initial basic feasible solution to the transportation problem using LCM.

Warehouse	Stores				Availability
	I	II	III	IV	
A	7	3	5	5	34
B	5	5	7	6	15
C	8	6	6	5	12
D	6	1	6	4	19
Demand	21	25	17	17	

15. 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	

16. Explain with an example how regret table can be prepared from payoff table.

17. An engineering comapny is offered a material handling equipment A. A is priced at Rs. 60000 including cost of installation and the cost for opertaion and maintenance are estimated to be Rs. 10000 for five years and increasing every year by Rs 3000 per year thereafter. The comapany expects a return of 10% on all its investments. What is the optimal replacement period. (operation and maintenance costs are charged only after first year)

18. Differentiate between PERT and CPM.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. A marketing manager wishes to allocate his annual advertising budget of Rs. 20,000 in two media vehicles A and B. The unit cost of a message in media A is Rs. 1,000 and that of B is Rs. 1,500. Media A is a monthly magazine and not more than one insertion is desired in one issue. At least 5 messages should appear in media B. The expected effective audience for unit messages in the media A is 40,000 and for media B is 55,000. (i) Develop a mathematical model for maximizing the total effective audience (ii) Solve it using simplex method.

20. Find the initial solution of the following transportation problem byVAM and optimum solution by MODI Method.

From	W_1	W_2	W_3	W_4	W_5	Available
F_1	3	4	6	8	9	**20**
F_2	2	2	10	1	5	**30**
F_3	7	11	20	40	3	**15**
F_4	2	1	9	14	16	**13**
Required	**40**	**6**	**8**	**18**	**6**	

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. A small project consisting of ten activities has the following characteristics:

	Activity	A	B	C	D	E	F	G	H	I	J
Time estimates in weeks	Preceding Activity	-	-	A	A	A	C	D	B,E	H	F,G,I
	Optimistic Time	4	1	2	3	2	1.5	1.5	2.5	1.5	1
	Most Likely Time	5	1.5	3	4	3	2	3	3.5	2.5	2
	Pessimistic Time	12	5	4	11	4	2.5	4.5	7.5	2.5	3

Draw the PERT network for the project and determine the critical path.

(2×5=10 weightage)