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Reg. No.....

Name.....

B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2022

Fourth Semester

Complementary Course - OPERATIONAL RESEARCH

(2013—2016 Admissions)

Time : Three Hours | Maximum Marks : 80

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. Write any one definition of O.R.
2. Write any one use of O.R. to a production specialist.
3. Define the term objective function of a general L.P.P.
4. Define the term feasible solution associated with a L.P.P.
5. What are slack variables ?
6. What is a bounded solution of a L.P.P. ?
7. Define artificial variables.
8. Define the terms origin and destination associated to a transportation problem.
9. Define the terms pure and mixed strategies.
10. Define saddle point.

(10 × 1 = 10)

Part B

Answer any **eight** *questions.*
Each question carries 2 *marks.*

11. What are the applications of O.R. ?
12. What are the different models in O.R. ?
13. What are the limitations of O.R. ?

Turn over

14. Explain the general linear programming problem.

15. Write the matrix form of a standard linear programming problem.

16. Write the difference between basic feasible solution and degenerate basic feasible solution.

17. How will you convert a minimisation problem to a maximisation problem.

18. Show that transportation problem is a special case of a L.P.P.

19. Define an unbalanced transportation problem.

20. How the problem of degeneracy arises in transportation problem ?

21. Distinguish between a zero - sum game and a non-zero sum game.

22. Explain Max-Min criterion.

(8 × 2 = 16)

Part C

Answer any **six** *questions.*
Each question carries 4 *marks.*

23. Explain the nature of O.R.

24. Discuss scientific method in O.R.

25. Old hens can be bought for ₹ 2.00 each but young ones cost ₹ 5.00 each. The old hens lay 3 eggs per week and young ones 5 eggs per week each being worth 30 paise. A hen costs ₹ 10.0 per week to feed. If one has only ₹ 80.00 to spend for hens, how many of each kind should one buy to give a profit of more than ₹ 6.00 per week, assuming that one cannot house more than 20 hens. Write the mathematical model of the above problem.

26. Solve graphically

Minimize $Z = 7y_1 + 8y_2$

subject to the constraints

$3y_1 + y_2 \geq 8$
$y_1 + 3y_2 \geq 11$
$y_1, y_2 \geq 0.$

27. Use simplex method to solve the L.P.P.

Maximise $Z = 2x_1 + x_2$

subject to the constraints

$x_1 + 2x_2 \leq 10$
$x_1 + x_2 \leq 6$
$x_1 - x_2 \leq 2$
$x_1 - 2x_2 \leq 1$
$x_1, x_2 \geq 0.$

28. Use Vogel's method to get an initial basic feasible solution to the following transportation problem :

Warehouses	Stores				Availability
	I	II	III	IV	
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	–1	4	2	19
Requirement :	21	25	17	17	80

29. Show that assignment problems are particular cases of transportation problems.

30. Solve the game whose pay-off matrix is given by

$$\begin{matrix} & B \\ A & \begin{bmatrix} 6 & 2 & 7 \\ 1 & 9 & 3 \end{bmatrix} \end{matrix}.$$

31. Consider the game G with the following pay-off matrix

$$\begin{matrix} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 2 & 6 \\ -2 & \mu \end{bmatrix} \end{matrix}.$$

a) Show that G is strictly determinable whatever μ may be

b) Determine the value of G.

$(6 \times 4 = 24)$

Turn over

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

32. Use big μ method to solve the problem, Minimize $Z = 2x_1 + x_2$

subject to the constraints

$3x_1 + x_2 = 5$
$4x_1 + 3x_2 \geq 6$
$x_1 + 2x_2 \leq 3$
$x_1, x_2 \geq 0.$

33. A company is spending ₹ 1,000 on transportation of its units from three plants to four distribution centres. The supply and demand of units, with unit cost of transportation are given below :

	Distribution centres				
Plants	D_1	D_2	D_3	D_4	Availability
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
Requirements :	5	8	7	15	

What can be the maximum saving by optimal scheduling ?

34. Solve the following assignment problem and find the minimum assignment cost.

	Jobs			
Persons	1	2	3	4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

35. a) Solve the following game :

	Player B				
	1	2	3	4	5
Player A I	3	5	4	9	6
II	8	7	9	8	7
III	5	6	3	7	8
IV	4	2	8	5	3

b) How the concept of dominance is used in simplifying the solution of a rectangular game.

(2 × 15 = 30)