

Bachelor of Rural Studies (BRS) (Honours) Examination, 2019
Semester-IV (CBCS)
Rural Studies
Course: CC-10
(Quantitative Techniques-III)

Time: Three Hours

Full Marks: 60

Questions are of value as indicated in the margin.

Group-A

Answer **any five** questions

5×2=10

1. Solve: Maximize $Z = 2x_1 - 3x_2$

Sub to, $x_1 + x_2 \leq 2$

$2x_1 + 2x_2 \geq 8$

$x_1 + x_2 \geq 0$.

2. Write down the nature of the solutions of an L.P.P.
3. Show that the vectors (1, 2, 3) and (4, -2, 7) are linearly independent.
4. Write the “Fundamental Theorem” of L.P.P.
5. Show that whatever may be the value of a, the game with the following payoff matrix is strictly determinable:

		B	
		I	II
A	I	3	7
	II	-3	a

6. In the game with the 2×2 payoff matrix

a	b
c	d

Where $a < d < b < c$, show that there is no saddle point.

Group-B

Answer **any five** questions

5×4=20

7. For what value of a, the game with the following payoff matrix is strictly determinable?

		B		
		I	II	III
A	I	a	5	2
	II	-1	a	-8
	III	-2	3	a

P.T.O.

(2)

8. Show that the problem

$$\text{Maximize } Z = 6x_1 + 10x_2$$

$$\text{Sub to, } 3x_1 + 5x_2 \leq 10$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0.$$

Has infinite number of optimal solution.

9. Show that $(1, 2, 3)$, $(4, -1, 2)$ and $(3, 1, -2)$ are linearly independent.

10. Find all the basic solutions of the system

$$x_1 + 2x_3 = 1$$

$$x_1 + x_3 = 4.$$

11. Solve the payoff matrix and find the value of the game:

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

12. Solve the game with the following payoff matrix:

B			
		B ₁	B ₂
A	A ₁	1	3
	A ₂	4	2

(3)

Group-C

Answer *any three* questions.

3×10=30

13. A firm manufacturing two types of medicines A and B, Can make a profit of Rs. 20 per bottle of A and Rs. 30 per bottle of B. Both A and B need for their production two essential chemicals C & D. Each bottle of A requires 3 liters of C and 2 liters of D and each bottle of B requires 2 liters of C and 4 liters of D. The total supply of these chemicals are 210 liters of C and 300 liters of D. The type B medicine contains alcohol and its manufacture is restricted to 65 bottles per month. How many bottles each of A and B should the firm manufacture per month to maximize its profit of the products? How much is this profit? (use graphical method).

14. Find all the basic feasible solutions of the equations

$$2x_1 + 6x_2 + 2x_3 + x_4 = 3$$

$$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

15. Solve the following problems graphically and show that the two problems have the same optimal value:

Minimize $z = 3x_1 + x_2$

Minimize $z = 2x_1 + x_2$

Sub to, $2x_1 + 3x_2 \geq 2$ Subject to, $2x_1 + x_2 \leq 3$

$$x_1 + x_2 \geq 1$$

$$3x_1 + x_2 \leq 1$$

$$x_1, x_2 \geq 0$$

$$x_1, x_2 \geq 0.$$

16. (a) Use dominance to reduce the payoff matrices and solve the games with the following payoff matrix

2	2	1	-2	-3
4	3	4	-2	0
5	1	2	5	6

- (b) Solve graphically the game whose payoff matrices is given below:

B

B₁ B₂ B₃ B₄

A

A ₁	2	2	3	-1
A ₂	4	3	2	6
