

Bachelor of Rural Studies (BRS) (Honours) Examination, 2018
Semester-IV
Rural Studies
Course-24

(Basic Mathematics for Rural Studies-II)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin

Group-A

Answer **any four** questions

4×2=8

1. State the Fundamental theorem of L.P.P.
2. Express $(-1, 2, 4)$ as a linear combination of $(-1, 2, 0)$, $(0, -1, +1)$ and $(3, -4, 2)$.
3. Show that $(1, 2, 0)$, $(0, 3, 1)$ and $(-1, 0, 1)$ are linearly independent.
4. Show that $(2, 2, 8)$, $(1, 0, 4)$ and $(1, 2, 4)$ are linearly dependent.
5. Examine whether a solution is possible or not:

$$\text{Max } Z = x_1 + x_2$$

$$\text{Sub to, } x_1 - x_2 \geq 0$$

$$2x_1 - x_2 \leq -2$$

$$\text{and } x_1, x_2 \geq 0.$$

6. Show that whatever may be the value of a , the game with the following payoff matrix is strictly determinable:

		B	
		I	II
A	I	4	7
	II	-2	a

Group-B

Answer **any two** questions

2×4=8

7. A manufacturer of patent medicines is preparing a production plan on medicines A and B. There are sufficient ingredients available to make 20000 bottles of A and 40000 bottles of B, but there are only 45000 bottles into which either of the medicines can be put. Furthermore it takes three hours to prepare enough material to fill 1000 bottles of A, it takes one hour to prepare enough material to fill 1000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8.00 per bottles of A and Rs. 7.00 per bottles of B. Formulate this as a linear programming problem to maximize the profit.
8. Make a graphical representation of the set of constraints in the following L.P.P.:

$$\text{Minimize } Z = 20x_1 + 10x_2$$

$$\text{Sub to, } x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$x_1, x_2 \geq 0.$$

Find the corner points of the feasible region. Hence find the optimal solution and write down the nature of the optimal solution.

P.T.O.

(2)

9. If a input-output matrix A is given by $A = \begin{pmatrix} 0.05 & 0.5 \\ 0.1 & 0 \end{pmatrix}$ and the external demand vector B is given by $B = \begin{pmatrix} 8000 \\ 2000 \end{pmatrix}$, then determine the production levels.

Group-C

Answer *any three* questions

3×8=24

10. A factory is engaged in manufacturing two products A and B which involve lathe work, grinding and assembling. The cutting, grinding and assembling times required for one unit of A are 2, 1 and 1 hours respectively and for one unit of B are 3, 1 and 3 hours respectively. The profits on each unit of A and B are Rs. 2.00 and Rs. 3.00 respectively. Assuming that 300 hours of lathe time, 300 hours of grinding time and 240 hours of assembling time are available. Formulate the above as a linear programming problem and solve it graphically.

11. (a) Find the basic feasible solution of the system of equations 5+3

$$x_1 + x_2 + x_3 = 8$$

$$3x_1 + 2x_2 = 18$$

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

- (b) Find the basic solution of the system of equation with x_2 as the non-basic variable

$$2x_1 + x_2 + 4x_3 = 11$$

$$3x_1 + x_2 + 5x_3 = 14$$

12. (a) Use dominance to reduce the payoff matrix and solve the game with the following payoff matrix: 4+4

		B			
		B ₁	B ₂	B ₃	B ₄
A	A ₁	-5	3	1	20
	A ₂	5	5	4	6
	A ₃	-4	-2	0	-5

- (b) For what value of a, the game with the following payoff matrix is strictly determinable?

		B		
		B ₁	B ₂	B ₃
A	A ₁	a	5	2
	A ₂	-1	a	-8
	A ₃	-2	3	a

(3)

13. (a) Reduce matrix game into 2×2 matrix game graphically and solve it

5+3

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

(b) Apply the maximin and minimax principle to solve the game with the payoff matrix

		B		
		B ₁	B ₂	B ₃
A	A ₁	15	2	3
	A ₂	6	5	7
	A ₃	-7	4	0
