Bachelor of Rural Studies (BRS) (Honours) Examination, 2019
Semester-II (CBCS)
Rural Studies
Course: CC-4
(Quantitative Techniques-I)

Time: Three Hours **Full Marks: 60**

Questions are of value as indicated in the margin.

Group-A

1. Answer ***any five***questions 5×2=10

(a) Find the value of *k* for which $f(x) = \begin{matrix} \frac{Sin\ 5x}{3x} & \text{if } x \neq 0 \\ k & \text{if } x = 0 \end{matrix}$ is continuous at *x* = 0.

(b) If $a = b^x, b = c^y$ and $c = a^z$ then show that xyz=1.

(c) Prove that $log_b^a \times log_c^b \times log_a^c = 1$

(d) Find the value of $\lim_{x \to 3} \frac{x^2-8x+15}{x^2+3x-18}$

(e) Show that the matrix A = $\begin{pmatrix} 1 & 2 & -3 & 4 \\ 2 & -5 & 6 & 10 \\ -3 & 6 & -7 & 9 \\ 4 & 10 & 9 & 13 \end{pmatrix}$ is Symmetric.

(f) Show that the matrix A = $\frac{1}{3}\begin{pmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ is orthogonal.

(g) Find the sum of 1+2+3+….+50.

Group-B

Answer ***any five*** questions 5×4=20

2. If α and β be the roots of the equation $3x^2 - 6x + 4 = 0$, find the value of $\left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right) - 3\alpha\beta$.

3. If a^2, b^2, c^2 are in A.P., Prove that the following is also in A.P. $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$.

4. If a, b, c are in G.P., then show that $\frac{a^2+ab+b^2}{ab+bc+ca} = \frac{a+b}{b+c}$

5. The co-ordinates of the vertices of a triangle are (0, 0), (5, 3) and (3, 5) respectively. Find the area of the triangle.

6. A function $f(x)$ is defined as follows:

$$f(x) = \begin{matrix} x^2 + 2 & \text{for} & 0 \leq x < 2 \\ x + 4 & \text{for} & 2 \leq x < 3 \\ x^2 + 1 & \text{for} & 3 \leq x \end{matrix}$$

Show that f is continuous at *x*=2 and discontinuous at *x*=3.

P.T.O.

7. If $A = \begin{pmatrix} 1 & 3 & -2 \\ 0 & -5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 6 & 4 & 3 \\ 1 & 9 & 5 \end{pmatrix}$, then find the value of $A^T, A + B, 2A - B$ and B^T.

8. If $A = \begin{pmatrix} 3 & 1 & 1 \\ 1 & -1 & 2 \\ 1 & 2 & -1 \end{pmatrix}$, then find the determinant of A.

Group-C

Answer ***any five*** questions 5×6=30

9. Solve by Cramer's Rule:

$2x - y - z = 4$

$3x + 4y - 2z = 11$

$3x - 2y + 4z = 11$

10. Find the inverse of the matrix $A = \begin{pmatrix} 1 & -2 & 3 \\ 0 & 2 & -1 \\ -4 & 5 & 2 \end{pmatrix}$.

11. (i) Show that $\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}} \times \left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}} \times \left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}} = 1.$ 4+2

(ii) Find the square root of $4\sqrt{3} + 6$.

12. Solve:

(i) $2\sqrt{x+5} - \sqrt{2x+8} = 2$ (ii) $\sqrt{4x-9} + \sqrt{4x+9} = 5 + \sqrt{7}$ 3+3

13. If $a^x = bc, b^y = ca, c^z = ab$, show that

(i) $\frac{x}{x+1} + \frac{y}{y+1} + \frac{z}{z+1} = 2$ (ii) $x + y + z + 2 = xyz$ 3+3

14. (i) A point divides externally the line segment joining the points (–2, 3) and (4, 5) in the ratio 2:1. Find the co-ordinates of the point. 3+3

(ii) If the fourth term of an A.P. is 11, then find the sum of the first 7 terms.

15. If $A = \begin{pmatrix} 1 & -3 & 4 \\ 2 & 7 & 4 \\ -5 & 6 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 6 & 9 & -1 \\ 3 & 0 & 2 \\ 0 & -4 & 1 \end{pmatrix}$

then find the value of AB and BA. Check whether AB and BA are equal or not.

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