UT-1/J-25: 51024
CALCULUS AND LINEAR ALGEBRA
BS-133

M.M. 75
Time-3Hrs

Note: All questions in Part-A and Part-B are compulsory. Attempt any four questions from Part-C selecting at least one from each unit.

PART-A (15 Marks)

Q. No. – 1 Answer the following questions. **15x1=15**

(i) $\beta\left(\frac{1}{2},\frac{1}{2}\right)$ =?

(ii) $\int_0^1 \int_0^{1-x} dxdy$

(iii) **Determine c lying between $(-2,3)$ if $f(x) = (x+2)^3(x-3)^4$**

(iv) **find $\lim_{x\to 0} \frac{logx}{cotx}$.**

(v) **To multiply a matrix by scalar multiply by….?**

(vi) **If A is a square matrix such that $AA'=I$, then the value of $A'A$ is...?**

(vii) **The eigen values of a triangular matrix are…?**

(viii) **Define Cramer's rule.**

(ix) **If determent of a matrix of order 3×3 is zero the rank of the matrix is…?**

(x) **Give an example which shows that R is not a vector space over C.**

(xi) **Find the dimension the vector space $Q\sqrt{2}$ over Q.**

(xii) **Any set of vectors which includes the zero vectors is linearly independent. (true/false)**

(xiii) **If λ is an eigen value of a symmetric matrix, then λ is….?**

(xiv) **If the rank of the matrix A is 3, then the rank of $3A^T$ is…?**

(xv) **A system of linear non- homogenous equation is consistent, if and only if the rank of the coefficient matrix is equal to the rank of…?**

PART-B (20 Marks)

UNIT-I

2 Solve $\lim_{x\to\frac{\pi}{6}} \frac{\cot^2 x-3}{\text{cosec } x-2}$ **5**

UNIT-II

3 Use Gauss Jordan method to find the inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$. 5

UNIT-III

4 Are the following vectors linearly dependent. If so, find the relation between them: (2,1,1), (2,0,-1), (4,2,1) 5

UNIT-IV

5 Find the characteristic equation of the matrix A=$\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$. 5

PART-C (40 Marks)

UNIT-I

6 Prove that $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)}$ 10

7 Find the volume of the solid formed by the revolution about the y axis, of the part of the parabola $y^2 = 4ax$ cut off by the latus- rectum 10

UNIT-II

8 Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$. 10

9 Test the consistency and solve them $x + 2y + z = 3, 2x + 3y + 2z = 5, 3x + 9y - z = 4$. 10

UNIT-III

10 If $T: R^2 \longrightarrow R^2$ is a linear operator and $T(1,0) = (2,3)$ and $T(0,1) = (-1,4)$ then find $T(1,-3)$. 10

11 Find a basis for the range of the linear transformation T defined by $T(x,y,z) = (x + 2z, 2x + y + 3z, x - y + 3z)$ 10

UNIT-IV

12 Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$ 10

13 Find the matrix P which transforms the matrix A=$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form. Hence Calculate A^4. 10

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