School of Basic and Applied Sciences

Mathematics

ETE - Jun 2023

Time : 3 Hours **Marks : 100**

Sem II - C1UC201T/B030201T - Matrices and Differential Equation and Geometry

Your answer should be specific to the question asked

Draw neat labeled diagrams wherever necessary

1. Define direction cosine & Direction ratio of a line & write relation between them . K2 CO1 (5)

2. Solve the Differential equation K1 CO1 (5)

$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} = 0$ given that y = 0 and $\frac{dy}{dx} = 1$ at x=0

3. K1 CO1 (5)

Find the value of λ if the matrix $\begin{bmatrix} \lambda & 1 & 2 \\ 0 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$ is singular

4) Find the condition of k such that the matrix has an inverse, obtain A^{-1} for k=1 K3 CO3 (10)

$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & k & 6 \\ -1 & 5 & 1 \end{bmatrix}$

OR

To find the polar equation of the tangent at the point α on the conic $\frac{1}{r} = 1 + ecos\theta$ K3 CO3 (10)

5. If a variable line in two adjacent positions has direction cosines as l, m, n & $l + \delta l, m + \delta m, n + \delta n$. show that the small angles $\delta\theta$ between the positions is given by : $\delta\theta^2 = \delta l^2 + \delta m^2 + \delta n^2$ K4 CO3 (10)

6. Find the equation to the plane through the ponts (2,3,1) & (4,-5,3) parallel to the x axis or perpendicular to yz plane . K3 CO2 (10)

7. A plane meets the coordinate axes in Points A,B&C such that the centroid of triangle ABC is the point (α, β, γ) .Prove that the equation of the plane ABC is $\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = 3$ K2 CO2 (10)

8) Trace the Hyperbola K4 CO4 (15)

$x^2 - 3xy + y^2 + 10x - 10y + 21 = 0$

OR

The tangents at two points P&Q of a conic meet in T. Prove that the vectorial angle of T is the semi-sum of the vectorial angles of P and Q . K4 CO3 (15)

9. Trace the parabola : K3 CO4 (15)

$16x^2 - 24xy + 9y^2 + 77x - 64y + 95 = 0$

Also find vertex, focus, directrix

10. Find the locus of a point, the sum of the squares of whose distances form the planes : K4 CO4 (15)

$x + y + z = 0$

$x - z = 0$

$x - 2y + z = 0$

is 9 .