

Math (Hons.) Paper-II (Sc./Arts)

Answer any six questions.

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- Find the condition that the line $lx + my + n = 0$ is tangent to the conic :
 $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$
- (a) Define conjugate points and conjugate lines with respect to a conic.
(b) Find the nature and position of the conic
 $36x^2 + 24xy + 29y^2 - 72x + 126y + 81 = 0$
- (a) Find the polar equation of a conic whose latus rectum is $2l$ and eccentricity e , the focus being the pole.
(b) Show that the equation $\frac{l}{r} = 1 + e \cos \theta$ and $\frac{l}{r} = -1 + e \cos \theta$ represent the same conic.
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- Define Confocal Conics. Prove that two confocal conics cut one another at right angles.
- (a) If l_1, m_1, n_1 and l_2, m_2, n_2 are directional cosines of two lines respectively, then find the angle between them.
(b) Prove that the points $(0, -1, 0)$, $(2, 1, -1)$, $(1, 1, 1)$ and $(3, 3, 0)$ are coplanar.
- (a) Find the equation of the plane in intercept form.
(b) The intercepts made by a plane on the coordinate axes are in the ratio $2 : 3 : 4$ if the plane passes through the point $(5, 0, -2)$, find its equation.
- (a) Find the equation of a line passing through a given point (α, β, γ) when its direction cosines are l, m, n .
(b) Find the equation of the perpendicular from the point $(1, 6, 3)$ to the line
$$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$$
- Define Central Conicoid. Find the equation for the plane $lx + my + nz = p$ to touch the conicoid $ax^2 + by^2 + cz^2 = 1$.
- State and prove De Moivre's Theorem for rational index.
- (a) Prove that $\log(\alpha + i\beta) = \frac{1}{2} \log(\alpha^2 + \beta^2) + i \tan^{-1} \frac{\beta}{\alpha}$
(b) Express in the form $A + iB$ the following $(\alpha + i\beta)^{x+iy}$
- Sum the series :
 $\cos x + \sin 3x + \cos 5x + \sin 7x + \dots + \sin(4n-1)x$
- Express \sin as an infinite product.

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