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Kannur Arts Science &  
Commerce College  
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SIIS-N 71 A-17

B.A./B.Sc. IInd Semester Degree Examination

Mathematics

(Calculus - II)

Paper : 2.2

(New)

Time : 3 Hours

Maximum Marks : 60

Instructions to Candidates : Answer all questions

Section - A

I. Answer any TEN of the following : (10 × 2 = 20)

- 1) Find the angle between the radius vector and the tangent of the curve  $r^2 = a^2 \cos 2\theta$ .
- 2) Show that the curves intersect orthogonally  $r^2 \cos 2\theta = a^2$  and  $r^2 \sin 2\theta = b^2$ .
- 3) Find the polar sub-normal at any point on  $r = a(1 + \cos \theta)$ .
- 4) Find  $\frac{ds}{dt}$  for the curve  $x = a \sec t$  and  $y = b \tan t$ .
- 5) Find the radius of curvature at any point (p,r) the curve  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2} - \frac{r^2}{a^2 b^2}$ .
- 6) Find the envelope of the family of lines  $x \cos \alpha + y \sin \alpha = r$  where  $\alpha$  is a parameter.
- 7) Define node and cusp.
- 8) Find the asymptotes parallel to the co-ordinates axes for the curve  $x^2 y - y = x$ .
- 9) If  $I_n = \int_0^{\pi/4} \tan^n x dx$ . Show that  $I_n + I_{n-2} = \frac{1}{n-1}$ .
- 10) Find the area bounded by the curve  $y = \sin^2 x$  the x-axis and the lines  $x = 0$  and  $x = \pi/2$ .
- 11) Show that the volume of sphere of radius is 'a' is  $\frac{4\pi a^3}{3}$ .
- 12) Define solid of revolution and surface of revolution.

**Section - B**

**II** Answer any **two** of the following.

**(2 × 5 = 10)**

- 1) Show that for the curve  $r^2 = a^2 \sec 2\theta$  the length of the perpendicular from the pole to the tangent is  $a\sqrt{\cos 2\theta}$ .
- 2) Find the pedal equation for the curve  $r = a + b \cos \theta$ .
- 3) Find the pedal equation for the Cartesian curves  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ .

**Section - C**

**III** Answer any **four** of the following.

**(4 × 5 = 20)**

- 1) Find  $\frac{ds}{dr}$  for the curve  $r = a(1 - \cos \theta)$ .
- 2) With usual notations prove that  $\rho = \frac{(1 + y_1^2)^{3/2}}{y_2}$ .
- 3) Find the radius of curvature at any point of the curve  $r^n = a^n \cos n\theta$ .
- 4) Find the co-ordinate of centre of curvature of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ . Also find its evolute.
- 5) Find all the asymptotes of the curve  $y^2 = 4ax$ .
- 6) Trace the curve  $y = a \cosh \left[ \frac{x}{a} \right] (a > 0)$ .

**Section - D**

**IV** Answer any **two** of the following.

**(2 × 5 = 10)**

- 1) Obtain the reduction formulae for  $\int \sin^n x dx$  and hence. Evaluate  $\int_0^{\pi/2} \sin^4 x dx$ .
- 2) Find the perimeter of curve  $r = a(1 - \cos \theta)$ .
- 3) Find the area common to the parabola  $x^2 = 4ay$  and  $y^2 = 4ax$ .

