



THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

MAT/ MAS 1601/131 Calculus-I

Max. Marks: 75

Time: 3 Hrs

Answer any FIVE questions:

(15 X 5 = 75marks)

- (i) If $x = \sin \theta, y = \cos p\theta$, prove that $(1-x^2)y_2 - xy_1 + py = 0$.

(ii) If y_n when $y = \frac{x^2}{(x-1)^2(x+2)}$
- Discuss the maxima and minima of the function $x^3y^2(6-x-y)$.
- Show that the evolute of the cycloid $x = a(\theta - \sin \theta); y = a(1 - \cos \theta)$ is another cycloid.
- (i) Establish a reduction formula $\int x^n \cos ax dx$.

(ii) Establish a reduction formula $\int \cos^n x dx$. Hence evaluate $\int_0^{\frac{\pi}{2}} \cos^8 x dx$.
- Show that the entire length of the astroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ is $6a$.
- Find the envelope of the straight line $\frac{x}{a} + \frac{y}{b} = 1$ where the parameters are related by the equation $a^2 + b^2 = c^2$.
- Show that the least value of $a^2 \sec^2 x + b^2 \operatorname{cosec}^2 x$ is $(a + b)^2$
