



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

MAS 1436

Maths for Chemistry-II

TIME: 3HRS

MAX: 75

ANSWER ANY FIVE QUESTIONS:

5x15=75

1. Find the n^{th} differential coefficient of $\cos^5 \theta \sin^7 \theta$.
2. Water is dripping out at the steady rate 1 c.c per sec through a tiny hole at the vertex of a conical vessel whose axis is vertical. When the slant height of the water in the filter is 4 cm, find rate of decrease of (i) the slant height of water (ii) the area of the water surface, given that the vertical angle of the vessel is 60 degree.
3. (a) If $u = \sin^{-1} \left(\frac{x+y}{\sqrt{x} + \sqrt{y}} \right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$.
(b) ABCD is regular protractor in which AB= 6 inches, BC=2 inches and O is the mid point of AB. An angle BOP is indicated by a mark P on the edge CD. If in setting an angle θ degrees, a mark is made $\frac{1}{100}$ of an inch along the edge from the correct spot. Show that error in the angle is $\frac{9 \sin^2 \theta}{10\pi}$ degrees approximately.
4. Find the maximum or minimum value of $2(x^2 - y^2) - x^4 + y^4$.
5. (a) Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)} dx$
(b) Evaluate $I = \int_0^{\pi/2} \log \sin x dx$
6. (a) The rate at which one substance combines with another is supposed to be proportional to the amount of the first substance remaining. If there be 15 grams of the first substance when $t = 0$ and 5 grams when $t = 8$ seconds, find how much will be left when $t = 5$ seconds. Also find the value of t when there is one gram left.
(b) Solve $(D^2 + 16) y = e^{-3x} + \cos 4x$.
7. Solve the equation $\frac{d^2y}{dt^2} + 2 \frac{dy}{dt} - 3y = \sin t$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$.
