



# THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2<sup>nd</sup> Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

## Backlog Arrear Examination, March 2021

**MAT 2432/2552**

**MATHS FOR CHEMISTRY - II**

**Max: 75 Marks**

**Time: 3 hours**

**ANSWER ANY FIVE QUESTIONS**

**(5 \* 15 = 75 MARKS)**

1. (a) If  $y = \sin(m \sin^{-1}x)$ , prove that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 - m^2)y_n = 0$ . (7)

(b) Show that the least value of  $a^2 \sec^2 x + b^2 \operatorname{cosec}^2 x$  is  $(a + b)^2$ . (8)

2. (a) If  $V = (x^2 + y^2 + z^2)^{-1/2}$ , show that  $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$ . (5)

(b) Establish S the area of a triangle ABC as a function of a, b, c and establish

the formula  $dS = R(\cos A da + \cos B db + \cos C dc)$  Where

$$S = \sqrt{s(s-a)(s-b)(s-c)} \quad (10)$$

3. (a) Evaluate  $\int \frac{2x+3}{x^2+x+1} dx$  (8)

(b) Evaluate using partial fraction  $\int \frac{2}{(1-x)(1+x^2)} dx$ . (7)

4. Solve the differential equations  $(D^4 + D^3 + D^2)y = 5x^2 + \cos x$ .

5. Solve the following simultaneous equations and find the expression for 'x' alone

$$3 \frac{dx}{dt} + \frac{dy}{dt} + 2x = 1,$$

$$\frac{dx}{dt} + 4 \frac{dy}{dt} + 3y = 0 \text{ given } x=0, y=0 \text{ at } t=0.$$

6. If  $u = a^3x^2 + b^3y^2 + c^3z^2$  where  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ , find the minimum value of  $u$ .

7. (a) Solve  $\frac{dy}{dx} + y \cos x = \frac{1}{2} \sin 2x$  (5)

(b) Find  $L^{-1} \left[ \frac{1}{(s+1)(s^2+2s+2)} \right]$ . (10)

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