



# 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/MAS 1442

Differential Equation with Laplace Transform

Duration: 3 Hrs

Marks: 75

Answer any Five questions (5×15=75)

1. Solve  $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$
2. Solve  $(D^2 + 4)y = \tan 2x$  by using method of variation parameter.
3. (a) Solve  $p + q = x + y$   
(b) Solve  $pxy + pq + qy = yz$
4. (a) Find  $L^{-1}\left(\frac{s-3}{s^2+4s+13}\right)$   
(b) Find  $L^{-1}\left(\frac{1}{(s+1)(s^2+2s+2)}\right)$
5. Solve  $\frac{dx}{dt} + 2x - 3y = t$ ,  $\frac{dy}{dt} - 3x + 2y = e^{2t}$
6. Verify divergence theorem for the function  $F = 2xz\mathbf{i} + yz\mathbf{j} + z^2\mathbf{k}$  over the upper half of the sphere  $x^2 + y^2 + z^2 = a^2$ .
7. (a) Prove that  $F = (y^2 \cos x + z^3)\mathbf{i} + (2y \sin x - 4)\mathbf{j} + (3xz^2 + 2)\mathbf{k}$  is irrotational and find its scalar potential.  
(b) Solve  $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ .