Roll No. ☐☐☐☐☐☐☐   **H**

TMA–201

B. Tech. (Second Semester)

(All Branches)
Mid Semester EXAMINATION, 2017

ENGINEERING MATHEMATICS–II

Time : 1:30 Hours]   [*Maximum Marks : 50*

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Fill in the blanks/True-False :   (1×5=5 Marks)

(a) If *m* and *n* are degree and order of the differential equation :

$$\left(\frac{d^2y}{dx^2}\right)^5 + 4\frac{\left(\frac{d^2y}{dx^2}\right)^3}{\frac{d^3y}{dx^3}} + \frac{d^3y}{dx^3} = x^2 - 1, \text{ then } m =$$

.... and n = ...

(b) If $\dfrac{1}{f(D)} x^n \cos ax$ is equal to real part of $e^{iax} \dfrac{1}{f(D+ia)} x^n$.   (True/False)

(c) Inverse Laplace transform of 1 is ....

(d) The solution of the differential equation $x\,dx + y\,dy = 0$ represents a hyperbola.   (True/False)

(e) Laplace transform of $\sin 2t$ is equal to $\dfrac{2}{s^2 + 4^2}$.   (True/False)

2. Attempt any *five* parts :   (3×5=15 Marks)

   (a) Define the difference between ordinary differential equation and partial differential equation with example.

   (b) Solve the differential equation :
   $$D^2 (D^2 + 1)^3 y = 0 .$$

   (c) Find $L \sin^3 3t$.

   (d) Find the inverse Laplace transform of $\log\left(1 + \dfrac{\alpha^2}{s^2}\right)$.

   (e) Find particular integral :
   $$(D - D')(D + D' - 3) z = xy$$

   (f) Find the inverse Laplace transform of :
   $$\frac{2s - 5}{4s^2 + 25} + \frac{4s - 18}{9 - s^2}$$

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c).   (5×2=10 Marks)

   (a) Write the Laplace transform of periodic function with period T and obtain Laplace transform of $f(t) = \sin \omega t$.

   (b) Solve the differential equation :
   $$\frac{d^2 y}{dx^2} + 2\frac{dy}{dx} + y = \frac{e^{-x}}{x^2}$$

   (c) Solve :
   $$(D^2 - DD' - 2D) z = \sin (3x + 4y)$$

4. Attempt any *two* parts of choice from (a), (b) and (c).   (5×2=10 Marks)

   (a) Solve :
   $$(D^2 - DD' - 2D'^2 + 2D + 2D')z = x^2 y$$

   (b) If $\dfrac{d^2 x}{dt^2} + \dfrac{g}{b}(x - a) = 0$; a, b and g are positive numbers and $x = a'$, $\dfrac{dx}{dt} = 0$ when $t = 0$, show that $x = a + (a' - a)\cos\sqrt{\dfrac{g}{b}}\,t$.

   (c) Solve the differential equation :
   $$\frac{d^2 y}{dx^2} + y = x - \cot x$$

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Find the inverse Laplace transform of :

$$\frac{1}{(s+1)(s^2+2s+2)}$$

(b) Find the Laplace transform of $t \sin 2t \cos 3t$.

(c) Using Laplace transforms, find the solution of the initial value problem

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = 0 \quad \text{where } y = 2, \ \frac{dy}{dx} = -4$$

at $x = 0$.

670