Total No. of Questions : 4]

SEAT No. :

PA-13

[Total No. of Pages : 3

[5931]-19

S.E. (Electrical)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (207006) (Semester - I)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) *Attempt Q.1 or Q.2 and Q.3 or Q.4.*
2) *Figures to the right indicate full marks.*
3) *Assume suitable data wherever necessary.*
4) *Use of electronic pocket calculator is allowed.*

Q1) a) Solve the following differential equations (Any two) : **[10]**

i) $\left(D^2 - D + 1\right) y = x^3 - 3x^2 + 1$

ii) $\left(D^2 - 6D + 9\right) y = \frac{e^{3x}}{x^2}$. (By method of variation of parameters).

iii) $(2x+3)^2 \frac{d^2y}{dx^2} - 2(2x+3)\frac{dy}{dx} - 12y = 6x$

b) Solve : $\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y}$ **[5]**

OR

Q2) a) Solve the following differential equations (Any two) : **[10]**

i) $\left(D^2 + 3D + 2\right) y = \sin\left(e^x\right)$

ii) $\left(D^2 - 2D - 1\right) y = e^x \cos x$

P.T.O.

iii) Solve the following simultaneous equations :

$$\frac{dx}{dt} + y = e^{t}$$

$$\frac{dy}{dt} + x = e^{-t}$$

b) An electric current consists of an inductance 0.1 henry, a resistance R of 20 ohms & a condenser of capacitance C of 25 micro farads. If the differential equation of electric circuit is $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = 0$, then find the charge '$q$' & current i at any time t, given that, at $t = 0$, $q = 0.05$ coulombs, $i = \frac{dq}{dt} = 0$ when $t = 0$. **[5]**

Q3) a) Solve any two of the following : **[10]**

i) Find Laplace Transform of $e^{-4t}\int_0^t \frac{\sin 3t}{t}\,dt$

ii) Find Inverse Laplace transform of $\frac{2s^2 - 1}{(s^2+1)(s^2+4)}$

iii) Find $L(t^2U(t-4))$

b) Solve differential equation by Laplace Transform

$$\frac{dy}{dt} + 2y(t) + \int_0^t y(t)\,dt = \sin t$$

subject to condition $y(0) = 1$ **[5]**

OR

Q4) a) Solve any two of the following : **[10]**

i) Find Laplace transform of $\frac{e^{-at}-e^{-bt}}{t}$

ii) Find Inverse Laplace transform of : $\frac{s+2}{\left(s^2+4s+5\right)^2}$

iii) Find L[sin2t δ(t–2)]

b) Solve differential equation by Laplace Transform **[5]**

$$\frac{d^2y}{dt^2}-3\frac{dy}{dt}+2y=12e^{-2t}$$

given that $y(0) = 2$; $y'(0) = 6$

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