

S.E. (Electrical Engineering) (Insem)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester-III) (207006)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2 and Q3 or Q4.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

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

i) $\frac{d^2 y}{dx^2} + y = \sin 2x \cos 2x$

ii) $\frac{d^2 y}{dx^2} + 9y = \frac{1}{\sin 3x}$ (By method of variation of parameters)

iii) $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = 4x^2$

b) Solve the following simultaneous differential equation: **[5]**

$$\frac{dx}{dt} + y = \sin t, \quad \frac{dy}{dt} + x = \cos t$$

OR

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

i) $(D^2 - 2D + 1)y = xe^x \sin x$

ii) $(D^2 + 3D + 2)y = e^{e^x}$

iii) $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{y - z}$

b) An inductor of 0.5 henry is connected in series with a capacitor of 0.02 farad, a resistor of 8 ohms and a generator having e.m.f. $80 \cos (10 t)$, $t \geq 0$, in series. Find the instantaneous charge q and current i , if $i = 0$, $q = 0$ at $t = 0$. **[5]**

P.T.O.

Q3) a) Solve any two of the following.

[10]

i) Find Laplace Transform of $\frac{\cos 2t - \cos t}{t}$

ii) Find Laplace Transform of $t^2 \cup (t-3)$

iii) Find $L^{-1} \left\{ \frac{1}{s(5^2 + 2^2)} \right\}$

b) Solve $\frac{d^2 y}{dt^2} + 4y = 9(t)$ given that $y(0)=0, y'(0)=7$ by using Laplace transform. [5]

OR

Q4) a) Solve any two of the following.

[10]

i) Find Laplace Transform of $e^t(t+2)^2$

ii) Find Laplace Transform of $\frac{\sin^2 t}{t}$

iii) Find $L^{-1} \left\{ \frac{3s+7}{s^2-2s-3} \right\}$

b) Solve the differential equation by Laplace transform.

[5]

$\frac{d^2 y}{dt^2} + 2\frac{dy}{dt} + y = te^{-t}$ Subject to $y(0) = 1, y'(0) = 2$

