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SEAT No. :

PB71

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**S.E. (Automobile and Mechanical Engineering)/
(Mechanical Sandwich)/ (Automation and Robotics Engg.) (Insem)**

**ENGINEERING MATHEMATICS-III
(2019 Pattern) (Semester-IV) (207002)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Solve any two of the following: [10]

i) $(D^2+1) y = e^{3x} + \cos (2x)$

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

iii) $x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^3$

b) Solve $\frac{dx}{y + zx} = \frac{dy}{x - yz} = \frac{dz}{x^2 - y^2}$ [5]

OR

Q2) a) Solve any two of the following [10]

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

ii) $(D^2 + 1) y = \sec x$ (use Method of variation of Parameters)

iii) $(x + 1)^2 \frac{d^2 y}{dx^2} - 4(x + 1) \frac{dy}{dx} + 6y = x$

P.T.O.

- b) A body of Weight $W=3N$ stretches a spring to 15cm. If the weight is pulled down 10 cm below the equilibrium position and then given a downward velocity 60 cm/sec, determine the amplitude, period and frequency of motion. [5]

Q3) a) Find the Laplace transform of the $f^n f(t)=e^{-3t} (3 \text{ Cosh } 3t-2 \text{ Sin h } 4 t)$ [5]

b) Find the inverse Laplace transform of $F(s)=\frac{3s+7}{(s-2)(s+1)}$ [5]

c) Find the fourier cosine transform of $f(x)=\begin{cases} x^2, & 0 < x < a \\ 0, & x > a \end{cases}$ [5]

OR

Q4) a) Find the fourier sine transform of the $f^n f(x)=e^{-x}+e^{-2x}, x \geq 0$ [5]

b) Solve the integral equation [5]

$$\int_0^{\infty} f(x) \sin \lambda x dx = \begin{cases} 1, & 0 \leq \lambda < 1 \\ 2, & 1 \leq \lambda < 2 \\ 0, & \lambda \geq 2 \end{cases}$$

c) Find the inverse Laplace transform of $F(s)=\frac{3s+1}{(s-1)(s^2+1)}$ [5]

