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SEAT No. :

PC-430

[Total No. of Pages : 2

[6359]-550

S.E. (Production and Industrial Engineering/Production Sandwich/Robotics and Automation) (Insem.)

**ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207007)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

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

Q1) a) Solve any two. [10]

i) $(D^2 - 4D + 4)y = e^{2x} \sec^2 x$ (variation of parameter)

ii) $(D^2 + 6D + 9)y = \frac{1}{x^3} e^{-3x}$

iii) $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = 4 \cos[\log(1+x)]$

b) $\frac{dx}{dt} + y = \sin t$

$\frac{dy}{dt} + x = \cos t$

[5]

OR

Q2) a) Solve any two. [10]

i) $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$ (variation of parameter)

ii) $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin(\log x)$

iii) $(D^2 + 2D + 1)y = xe^{-x} \cos x.$

P.T.O.

- b) A body weighing $W = 20\text{N}$ is hung from a spring. A pull of 40N will stretch the string to 10 cm . The body is pulled down to 20cm below the static equilibrium position and then released. Set up the differential equation. Find the position and velocity as function of time t . [5]

- Q3)** a) Find the Laplace transform of : $te^{3t} \sin 2t$. [5]
 b) Find the inverse Laplace transform of [5]

$$F(s) = \frac{s-1}{s^2 - 6s + 2s}$$

- c) Solve the following integral equation, [5]

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

OR

- Q4)** a) Find the Laplace transform of : $\int_0^{\infty} e^{-t} \frac{\sin t}{t} dt$. [5]

- b) Find the fourier cosine transform of $f(x) = e^{-x}$ and hence

$$s.t \int_0^{\infty} \frac{\cos mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}$$
 [5]

- c) Solve the integral equation,

$$\int_0^{\infty} f(x) \cos \lambda x dx = e^{-\lambda}, \lambda > 0$$
 [5]

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