Total No. of Questions : 4]

SEAT No. :

PA-33

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

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - I) (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) $\left(D^2+3D+2\right)y=e^{e^x}$ (variation of parameter).

ii) $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=x^2e^{3x}$.

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

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

$-\frac{dy}{dt}+x=e^{-t}$. **[5]**

OR

Q2) a) Solve any two: **[10]**

i) $\frac{d^2y}{dx^2}+y=\operatorname{cosec}x$ (variation of parameter).

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

iii) $(D^2 - 7D +10)\ y = e^{2x} \sin x$.

b) A body of weight w = 1 N is suspendeal from spring stretches it 4 cm. If the weight is pulled down 8 cm below the equilibrium position and then released. Set up the differential equation. Find the position and velocity as function of time *t*. **[5]**

P.T.O.

Q3) a) Find the Laplace transform of: $e^{-t}t\sin t$ **[5]**

b) Find the inverse Laplace transform of: $F(s)=\dfrac{s}{s^2+6s+25}$ **[5]**

c) Using Fourier integral representation show that

$$\int_0^{\infty}\frac{(1-\cos\lambda\pi)}{\lambda}\sin\lambda x\,d\lambda=\begin{cases}\pi/2 & , \quad 0<x<\pi\\ 0 & , \quad x>\pi\end{cases}. \qquad \textbf{[5]}$$

OR

Q4) a) Find the Laplace transform of : $\dfrac{\cos 6t-\cos 4t}{t}$ **[5]**

b) Find the Fourier cosine transform of $f(x)=\dfrac{\pi}{2}e^{-x}$. **[5]**

c) Solve the integral equation. $\int_0^{\infty} f(x)\cos\lambda x\,dx=\begin{cases}1-\lambda & 0\le\lambda\le 1\\ 0 & \lambda>1\end{cases}$. **[5]**

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