Total No. of Questions : 4]

SEAT No. :

PA-10001

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S.E. (Mechanical/Mechanical Sandwich/Automobile & Mechanical/Automation & Robotics) (InSem.)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - II) (207002)

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 indicate full marks.*
3) *Use of electronic pocket calculator is allowed.*
4) *Assume suitable data, if necessary.*

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

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

ii) $\frac{d^2y}{dx^2}+y=\operatorname{cosec} x$, use method of variation of parameters.

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

b) Solve $\frac{dx}{y^2}=\frac{dy}{x^2}=\frac{dz}{x^2y^2z^2}$. **[5]**

OR

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

i) $\frac{d^2y}{dx^2}-7\frac{dy}{dx}+6y=e^{3x}+3$.

ii) $\frac{d^2y}{dx^2}+9y=\sec 3x$, use method of variation of parameters.

P.T.O.

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

b) A body of weight 1 N is suspended from spring stretches it 4 cm. If the weight is pulled down 8 cm below the equilibrium position and then released, find the displacement, velocity at time t and amplitude of the motion. **[5]**

Q3) a) Find the Laplace transform of the function **[5]**

$$f(t)=e^{-4t}\int_0^t \frac{\sin 3t}{t}dt.$$

b) Find the inverse Laplace transform of **[5]**

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

c) Find the Fourier cosine and sine transform of the function **[5]**

$$f(x)=e^{-2x}+4e^{-3x},(x>0).$$

OR

Q4) a) Find the Fourier cosine transform of the function $f(x)=e^{-2x}-e^{-3x}\,(x>0)$. **[5]**

b) Solve the integral equation **[5]**

$$\int_0^\infty f(x)\sin\lambda x\,dx=\begin{cases}1-\lambda, & 0\le\lambda<1\\ 0, & \lambda\ge 1\end{cases}.$$

c) Find the inverse Laplace transform of **[5]**

$$f(s)=\frac{s^2-2s+3}{(s-1)^2(s+1)}.$$

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