Total No. of Questions – [3] Total No. of Printed Pages: 2

G.R. No.	

Paper Code - EU239-151 (T1)

OCTOBER 2019 INSEM (T1)
S. Y. B.TECH. (Mechanical) (SEMESTER –III)

COURSE NAME: Engineering Mathematics III
COURSE CODE: ES21181ME
(PATTERN 2018)

Time: [1 Hour] [Max. Marks: 20]

(*) Instructions to candidates:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed.
4) Assume suitable data where ever required.

Q 1) Attempt any **One**

a)

- $\left(D^3+D^2-D-1\right)y=4\sin x\cos x$
- $\left(x^2\frac{d^2y}{dx^2}+5x\frac{dy}{dx}+3y\right)=\frac{\log x}{x^2}$ **[8]**

b)

- $\left(D^2-4D+4\right)y=e^{2x}\ x^{-2}$ (Using Method of variations of parameter)
- $\left((x+1)^2\frac{d^2y}{dx^2}-(x+1)\frac{dy}{dx}-3y\right)=6x$ **[8]**

Q 2) Attempt any **One**

a)

- $\frac{dx}{3z-4y}=\frac{dy}{4x-2z}=\frac{dz}{2y-3x}$
- A body weighing W=20N is hung from a spring. A pull of 40N will stretch the spring to 10 cm. The body is pulled down to 20 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position in time t seconds, the maximum velocity and period of oscillation. **[8]**

b)

- $\frac{dx}{dt}+4x+3y=1\ ;\ \frac{dy}{dt}+2x+5y=e^t$
- The D.E satisfied by a beam, uniformly loaded with one end-fixed and second subjected to a tensile force P is given by $EI\frac{d^2y}{dx^2}-Py=-\frac{W}{2}x^2$

Show that the elastic curve for the beam under conditions

$y = 0, \frac{dy}{dx} = 0, when\ x = 0$ is given by $y = \frac{W}{2P}\left[x^2 + \frac{2}{n^2} - \frac{e^{nx}}{n^2} - \frac{e^{-nx}}{n^2}\right] where\ EI = \frac{P}{n^2}$

[8]

Q 3) Attempt any **one**

a) Find Fourier sine transform of $f(x) = e^{-x}\cos x\ , x > 0$ **[4]**

b) Using Fourier integral representation show that **[4]**

$$\int_0^2 \frac{2\cos\lambda x}{1+\lambda^2}\, d\lambda = \begin{cases} 0, & x < 0 \\ \pi e^{-x}, & x \geq 0 \end{cases}$$

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