Total No. of Questions : 4]

SEAT No. :

P5424

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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) $\frac{d^2y}{dx^2} + y = \tan x$ (using variation of parameters)

ii) $(D^2-4D+4)\, y = e^{2x} \sin 3x$

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

b) Solve: $4\frac{du}{dx} + u - v = 0$

$2\frac{dv}{dx} - v + u = 0$ **[5]**

OR

Q2) a) Solve any Two. **[10]**

i) $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = x^{-2}e^{3x}$ (using variation of parameters)

ii) $(D^2+2D+1)\, y = xe^{-x} \sin x$

iii) $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5 + 2x^3$

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b) A body of weight W=3N stretches a spring to 15 cm. If the weight is pulled down 10 cm below the equilibrium position and then given a downward velocity 60 cm/sec; then construct and solve the equation of motion. **[5]**

Q3) a) Find the Laplace transform of $f(t) = e^{-4t} \int_0^t t \sin 3t \, dt.$ **[5]**

b) Find the inverse Laplace transform of $F(s) = \frac{1}{s^4 - a^4}$. **[5]**

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

OR

Q4) a) Find the Laplace transform of $f(t) = \begin{cases} \sin 2(t-\pi) & ; t > \pi \\ 0 & ; t < \pi \end{cases}$ **[5]**

b) Find the Fourier cosine integral representation for the function

$$f(x) = \begin{cases} x^2 & ; 0 < x < a \\ 0 & ; x > a \end{cases}$$ **[5]**

c) Using Fourier integral representation, show that

$$\int_0^\infty \left(\frac{1 - \cos \pi\lambda}{\lambda} \right) \sin \lambda x d\lambda = \begin{cases} \pi/2 & ; 0 < x < \pi \\ 0 & ; x > \pi \end{cases}$$ **[5]**

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