Total No. of Questions : 4]

SEAT No. :

**PB-23**

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**S.E. (Comp/IT/AI&ML/CS&DE) (Insem)**

**ENGINEERING MATHEMATICS - III**

**(2019 Pattern) (Semester - IV) (207003)**

*Time : 1 Hours]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) *Attempt Q1 or Q2 and Q3 or Q4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume Suitable data if necessary.*

***Q1)*** a) Solve any two **[10]**

i) $\frac{d^2y}{dx^2} + 4y = x\sin x$

ii) $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$ (Use method of variation of parameters)

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

b) Solve : $\frac{dx}{y + xz} = \frac{dy}{-x - yz} = \frac{dz}{x^2 - y^2}$. **[5]**

OR

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

i) $(D^2 + 2D + 1)y = 4\sin 2x$

ii) $(D^2 + 4)y = \sec 2x$ (Use method of variation of parameters)

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

*P.T.O.*

b) Solve the following simultaneous equations : **[5]**

$$\frac{dx}{dt} + 5x - 2y = 0$$
$$\frac{dy}{dt} + 2x + y = 0$$

***Q3)*** a) By using Fourier integral representation show that $\int_0^\infty \frac{\cos \lambda x}{1+\lambda^2} d\lambda = \frac{\pi}{2} e^{-x}, x > 0$. **[5]**

b) Attempt any one : **[5]**

i) Find inverse z-transform of $F(z) = \frac{6z}{(z+2)(z-4)}, |z| > 4, k \geq 0$

ii) Find z-transform of $f(k)$ if $f(k) = e^k, k \geq 0$

c) Solve difference equation $f(k+1) + 4f(k) = 4^k, k \geq 0$ given $f(0) = 0$. **[5]**

OR

***Q4)*** a) Solve any one : **[5]**

i) Find z-transform of $f(k) = 3^k \sin(2k+3), k \geq 0$

ii) Find inverse z-transform of $F(z) = \frac{1}{(z-4)(z-5)}$ by inversion integral method.

b) Find Fourier sine transform of $f(x) = \begin{cases} \sin x & , 0 < x < a \\ 0 & , x \geq a \end{cases}$. **[5]**

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

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