Total No. of Questions : 4]

SEAT No. :

PE-538

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S.E. (Electronics / E&Tc / E&C (VLSI Design & Technology)/ (Advanced Communication Technology)) (Insem.)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207005)

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

Instructions to the candidates :

1) *Attempt Q.1 or Q.2 and Q.3 or Q.4.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Use of non-programmable scientific calculator is allowed.*
5) *Assume suitable data, if necessary.*

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

i) $(D^3 + 4D)y = \sin 2x$.

ii) Solve by method of variation of parameters $(D^2 - 4D + 4)y = e^{2x}.\sec^2 x$.

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

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

OR

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

i) $(D^2 + 6D + 9)y = \frac{1}{x^3}e^{-3x}$.

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

iii) $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x$

b) An inductor of 0.5 henries is connected in series with a resistor of 6 ohms, a capacitor of 0.02 Farads, a generator having alternative voltage given by 24 sin(10t), $t > 0$ At $t = 0$, the charge Q and the current I are zero. Find the charge Q at any time t. **[5]**

P.T.O.

Q3) a) Find Fourier sine transform of $f(x)=\begin{cases} x & 0\le x\le 1 \\ 2-x & 1<x\le 2 \\ 0 & x>2 \end{cases}$. **[5]**

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

i) Find z-transform of $f(k)=3^k \cos 4k,\ k\ge 0$.

ii) Find inverse z-transform of $F(z)=\dfrac{1}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{3}\right)},\ |z|>\dfrac{1}{2}$.

c) Solve the following difference equation

$$f(k+1)+\frac{1}{4}f(k)=\left(\frac{1}{4}\right)^k,\ k\ge 0,\ f(0)=0.$$ **[5]**

OR

Q4) a) Using Fourier integral representation show that

$$\frac{2}{\pi}\int_0^\infty \frac{k\cos\lambda x}{\lambda^2+k^2}d\lambda = e^{-kx},\ k>0.$$ **[5]**

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

i) Find z-transform of $f(k)=k^2,\ k\ge 0$

ii) Find inverse z-transform of $F(z)=\dfrac{2z^2-3z}{(z+2)(z-4)},\ |z|<2$.

c) Solve : $\int_0^\infty f(x)\sin\lambda x\,dx=\begin{cases} 1, & 0<\lambda<1 \\ 2, & 1<\lambda<2 \\ 0, & \lambda>2 \end{cases}$. **[5]**

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