Total No. of Questions : 4] **SEAT No. :** [ ]

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[6359]-511

S.E. (Electronics/E & TC/Electronics & Computer/ Electronics Eng.(VLSI Design & Tech.)/ Electronics & Comm.-Adv. Comm. Tech.) (Insem)

ENGINEERING MATHEMATICS -III

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

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

Instructions to the candidates:

1) ***Answer 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) $\left(D^2-1\right)y=\frac{1}{2}\left(1-\cos x\right)$

ii) $\left(D^2+4\right)y=$ cosec $(2x)$ [By Method of variation of Parameters]

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

b) Solve : $\frac{dx}{3z-4y}=\frac{dy}{4x-2z}=\frac{dz}{2y-3x}$ **[5]**

OR

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

i) $(D^2+2D+1)y=e^{-x}\sin x$

ii) $(D^2+3D+2)y=e^{e^x}$ [By Method of Variation of Parameters]

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

P.T.O.

b) An uncharged condenser of capacity 'C' charged by applying emf of value 'E sin(wt)', where $w = \frac{1}{\sqrt{LC}}$ through the leads of inductance 'L' and of negligible resistance 'R'. The charge 'Q' on the plate of condenser satisfies the differential equation

$\frac{d^2Q}{dt^2} + \frac{Q}{LC} = \frac{E}{L}\sin\left(\frac{t}{\sqrt{LC}}\right)$, then find the charge 'Q' at any time 't' **[5]**

Q3) a) Using Fourier integral representation show

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

b) Solve any one. **[5]**

i) Find $z\{f(k)\}$ where $f(k) = \frac{2^k}{k}; k \geq 1$

ii) Find inverse z-transform of

$$F(z) = \frac{3z^2 + 2z}{z^2 - 3z + 2},\ 1 < |z| < 2$$

c) Solve the following difference equation: **[5]**

$$f(k+1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k, k \geq 0,\ f(0) = 0$$

OR

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

i) Find $z\{f(k)\}$ if

$$f(k) = 2^k \cos(3k+2)\ ;\ \text{if } k \geq 0$$

ii) Find $z^{-1}\left[\frac{z^2}{(z^2+1)}\right]$ by inversion integral method

b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}, x > 0$ **[5]**

c) Solve integral equation: **[5]**

$$\int_0^\infty f(x)\sin\lambda x\, dx = \begin{cases} 1-\lambda & ;\ 0 \leq \lambda \leq 1 \\ 0 & ;\ \lambda \geq 1 \end{cases}$$