PC391

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

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

b) Solve : $\dfrac{dx}{3z - 4y} = \dfrac{dy}{4x - 2z} = \dfrac{dz}{2y - 3x}$ **[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 $w = \dfrac{1}{\sqrt{LC}}$ 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 $\displaystyle\int_0^\infty \frac{1-\cos\lambda\pi}{\lambda}\sin\lambda x\, d\lambda = \begin{cases} \dfrac{\pi}{2} & ; \ 0 < x < \pi \\ 0 & ; \ x > \pi \end{cases}$ **[5]**

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

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

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

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

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

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

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