

Total No. of Questions : 4]

SEAT No. :

PC391

[6359]-511

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

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

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

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

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

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

- Q3) a) Using Fourier integral representation show

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

- 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

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

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

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

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]

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

