Total No. of Questions : 4]

SEAT No. : ____

P-5385

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S.E. (Electronics)/(E&Tc)/(Electronics & Computer Engg.) (Insem.)

ENGINEERING MATHEMATICS - III

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

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

Instructions to the candidates :

1) ***Answer Q1 or Q2 and Q3 or Q4.***
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) $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 2\sin x - 3e^{-2x}$

ii) Solve by method of variation of parameters.

$$\frac{d^2y}{dx^2} + y = \sec x$$

iii) $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5$

b) $\frac{dx}{x^2+y^2} = \frac{dy}{2xy} = \frac{dz}{(x+y)^3 z}$ **[5]**

OR

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

i) $(D^2-20+1)y = xe^x \sin x$

ii) Solve by method of variation of parameters.

$$\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$$

iii) $(2x+3)^2\frac{d^2y}{dx^2} - 2(2x+3)\frac{dy}{dx} - 12y = 6x$

P.T.O.

b) An uncharged condenser of capacity C charged by applying an e.m.f. of value $E \sin \frac{1}{\sqrt{LC}}$ through the leads of inductance L and negligible resistance. The charge 2 on the plate of condenser satisfies the differential equation $\frac{d^2q}{dt^2} + \frac{Q}{LC} = \frac{E}{L}\sin\frac{t}{\sqrt{LC}}$ prove that the charge at any time *t* is given by $Q = \frac{Ec}{2}\left[\sin\frac{t}{LC} - \frac{t}{\sqrt{LC}}\cos\frac{t}{\sqrt{LC}}\right]$. **[5]**

Q3) a) Find Fourier cosine transform of **[5]**

$f(x) = e^{-2x}, x > 0$

b) Attempt any ONE **[5]**

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

ii) Find inverse z transform of

$$F(z) = \frac{1}{z-a}, |z| > |a|$$

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

$f(k+2) - 4f(k) = 0$, $f(0)=0$, $f(1) = 2$

OR

Q4) a) Attempt any ONE **[5]**

i) Find Z transform of $f(k) = k5^k, k \geq 0$.

ii) Find inverse z transform of $F(z) = \frac{z^2}{z^2+1}, |z| > 1$ by inversion integral method.

b) Find Fourier transform of **[5]**

$$f(x) = \begin{cases} 1 & , |x| < a \\ 0 & , |x| > a \end{cases}$$

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

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