Total No. of Questions : 4]

SEAT No. :

PA-4

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S.E. (Electronics / E & TC / Electronics & Computer)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - I) (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) $(D^2 - 4D + 3)y = x^3e^{2x}$

ii) Solve by variation of parameters method

$(D^2 + 4)y = \sec 2x$

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

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) $\frac{d^2y}{dx^2} + 4y = x\sin x$

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

Solve by variation of parameters method.

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

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b) A circuit consists of an inductance L and condenser of capacity C in series. An alternating emf Esinnt is applied to it at time $t = 0$, the initial current and charge being zero, find the current flowing in the circuit at any time t for $w \neq n$ where $w^2 = \frac{1}{LC}$ **[5]**

Q3) a) Find the Fourier cosine transform of the function $f(x) = \begin{cases} \cos x & 0 < x < a \\ 0 & n > a \end{cases}$ **[5]**

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

i) Find the z - transform of $f(k) = \sin\left(\frac{k\pi}{4} + 8\right), k \geq 0$

ii) Find the inverse z - transform of

$$f(z) = \frac{1}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}, |z| > \frac{1}{2}$$

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

$12f(k+2) - 7f(k+1) + f(k) = 0 \; ; k \geq 0$

$f(0) = 0, f(1) = 3$

OR

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

i) Find the z-transform of $f(k) = k\,5^k, k \geq 0$

ii) Find inverse z-transform by inversion integral method

$$f(z) = \frac{1}{(z-2)(z-3)}$$

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

$$f(x)=\begin{cases} x & 0\le x\le 1 \\ 2-x & 1\le x\le 2 \\ 0 & x>2 \end{cases}$$

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

$$\int_0^{\infty} f(x)\cos\lambda x\,dx = e^{-\lambda},\ \lambda>0$$

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