AR18

CODE: 18BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Regular/Supplementary Examinations, November-2020

DIFFERENTIAL EQUATIONS AND TRANSFORM THEORY

(Common to EEE, ECE Branches)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Solve $\frac{dy}{dx} = \frac{1}{(1+x^2)}(e^{tan^{-1}x} - y)$ 6M

   b) Solve $(D^2 - 4D + 3)y = e^x \cos 2x + \cos 3x$ 6M

(OR)

2. a) Solve $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ 6M

   b) Solve $(D^2 + 2)y = e^{-2x} + \cos 3x$ 6M

UNIT-II

3. a) Obtain Fourier series expansion of $f(x) = e^{ax}$ in $(0, 2\pi)$ 6M

   b) Find the Fourier series expansion of 6M

$$f(t) = \begin{cases} 0 & if -2 \le t \le -1 \\ 1+t & if -1 \le t \le 0 \\ 1-t & if\ 0 \le t \le 1 \\ 0 & if\ 1 \le t \le 2 \end{cases}$$

(OR)

4. Find the Fourier series expansion of $f(x) = x + x^2$ in $(-\pi, \pi)$ 12M

UNIT-III

5. a) Using Fourier integral, show that 6M

$$e^{-ax} = \frac{2a}{\pi}\int_0^\infty \frac{\cos\lambda x}{\lambda^2 + a^2} d\lambda \ (a > 0, x \ge 0)$$

   b) Find the Fourier transform of 6M

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

(OR)

6. Find the Fourier sine and cosine transforms of $2e^{-5x} + 5e^{-2x}$ 12M

UNIT-IV

7. a) Find the $L\{te^{-2t}sint\}$ 6M

   b) Find $L^{-1}\left\{\dfrac{s+1}{(s^2+2s+2)^2}\right\}$ 6M

(OR)

8. a) Using Convolution theorem find $L^{-1}\left\{\dfrac{s}{(s^2+a^2)^2}\right\}$ 6M

   b) Using Laplace transforms solve $y'' - 2y' - 8y = 0; y(0) = 3, y'(0) = 6$ 6M

UNIT-V

9. a) Find $Z[(n+1)^2]$ 6M

   b) Find $Z^{-1}\left[\dfrac{4z^2-2z}{z^3-5z^2+8z-4}\right]$ 6M

(OR)

10. a) Find $Z[n\,cos\theta]$ 6M

    b) Use Convolution theorem to evaluate $Z^{-1}\left[\dfrac{z^2}{(z-a)(z-b)}\right]$ 6M

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(AUTONOMOUS)

I B.Tech II Semester Regular/Supplementary Examinations, November-2020

DIFFERENTIAL EQUATIONS

(Common to CE, ME, CSE, IT Branches)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Solve $y(2xy + e^x)dx - e^x dy = 0$. 6M

   b) Obtain the Orthogonal Trajectories for the family of curves $r^n = a^n \cos n\theta$. 6M

(OR)

2. a) Solve the differential equation $(1 - x^2)\frac{dy}{dx} + xy = y^3 \sin^{-1} x$. 6M

   b) The temperature of the body drops from 100 ^{0}C to 75^{0}C in 10 minutes when the surrounding air is at 20^{0}C temperature ,i) What will be its temperature after half an hour? ii) When will the temperature be 25^{0}C? 6M

UNIT-II

3. a) Solve $(D^4 + 10D^2 + 9)y = \cos(2x + 3)$. 6M

   b) Solve $(D^3 + 6D^2 + 9D)y = e^{-3x}$ 6M

(OR)

4. a) Solve $(D^2 - 2D - 3)y = x^3 e^{-3x}$ 6M

   b) Solve $(D^2 + 5D - 6)y = \sin 4x \sin x$ 6M

UNIT-III

5. Prove that 12M

$$\int_0^1 xJ_n(\alpha x)\,J_n(\beta x)dx = \begin{cases} 0, & \text{if } \alpha \neq \beta \\ \frac{1}{2} J^2{}_{n+1}(\alpha), & \text{if } \alpha = \beta \end{cases}$$

(OR)

6. a) Express $f(x) = 4x^3 - 2x^2 - 3x + 8$ in terms of Legendre's polynomials. 6M

b) Prove that $J_{\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}}\,\{(\frac{3-x^2}{x^2})\text{Sin}x - \frac{3}{x}\text{Cos}x\}$ 6M

UNIT-IV

7. a) Form the Partial differential equation of all planes having equal intercepts on X and Y axes. 6M

b) Solve the Partial differential equation $p^3 + q^3$=27 z , where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$ 6M

(OR)

8. a) Solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$ 6M

b) Form the Partial differential equation by eliminating the arbitrary function f from $z = xy + f(x^2 + y^2)$ 6M

UNIT-V

9. a) Solve $(D^2 - 4DD^* + 4D^{*2})z = e^{2x+y}$ where $\frac{\partial}{\partial x} \equiv D$ and $\frac{\partial}{\partial y} \equiv D^*$ 6M

b) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = xy$ 6M

(OR)

10. a) Solve $(D^2 + DD^* - 6D^{*2})z = x + y$ where $\frac{\partial}{\partial x} \equiv D$ and $\frac{\partial}{\partial y} \equiv D^*$ 6M

b) Solve $(D^3 - 7DD^{*2} - 6D^{*3})z = e^{x+2y}$ where $\frac{\partial}{\partial x} \equiv D$ and $\frac{\partial}{\partial y} \equiv D^*$ 6M

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