AR18

CODE: 18BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-2021

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 $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+9y=\frac{e^{-3x}}{x^3}$ 6M

   b) Solve $\frac{d^2y}{dx^2}+y=\sin 3x\cos 2x$ 6M

(OR)

2. Solve $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=\sin x$ by method of variation of parameters 12M

UNIT-II

3. Find the Fourier series for f(x), if $f(x)=\begin{cases}-\pi & -\pi<x<0\\ x & 0<x<\pi\end{cases}$ 12M

   and deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+----$

(OR)

4. a) Find the cosine series for $f(x)=\pi-x\ in\ 0<x<\pi$ 6M

   b) Find the Fourier series for $f(x)=x^2\ in\ -\pi<x<\pi$ 6M

UNIT-III

5. a) Find the Fourier transform of the function 6M

$$f(x)=\begin{cases}1+x/a & -a<x<0\\ 1-x/a & 0<x<a\\ 0 & otherwise\end{cases}$$

   b) Find Fourier cosine transform of $f(x)=e^{-a^2x^2}$ and hence evaluate Fourier sine transform of $f(x)=xe^{-a^2x^2}$ 6M

(OR)

6. Using Fourier integral show that 12M

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

UNIT-IV

7. Solve by using Laplace transform the differential equation 12M

$D^2 - 4D + 4y = e^{2t}, y(0) = 0 \;\&\; y^{/}(0) = 0$

(OR)

8. a) Find the Inverse Laplace transform of $\frac{2s^2-6s+5}{(s-1)(s-2)(s-3)}$ 5M

b) Find i) $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right)$ ii) $L^{-1}\left(\frac{e^{-s}}{(s+1)^3}\right)$ 7M

UNIT-V

9. Find $Z(n^2)$ using $Z(n^2)$Show that 12M

$$Z(n^2a^n) = \frac{az^2+a^2z}{(z-a)^3}$$

(OR)

10. Find the inverse Z-Tranform of $\frac{1}{(z-3)(z-2)}$ 12 M

$i)|z| < 2 \; ii) 2 < |z| < 3 \;\; iii)|z| > 3$

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CODE: 18BST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI (AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-2021

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) $Solve\ \frac{dy}{dx}+\frac{2}{x}y=x$ — 6M

   b) Find the orthogonal trajectory of the $r=a(1+\cos\theta)$ — 6M

(OR)

2. a) Solve $(x^2+2ye^{2x})dy+(2xy+2y^2e^{2x})dx=0$ — 6M

   b) Uranium disintegrates at a rate proportional to the amount present at any instant. If m1 and m2 grams of uranium are present at time t1 and t2 respectively, show that half life of uranium is $\frac{(t_1-t_2)\log 2}{\log\frac{m_1}{m_2}}$ — 6M

UNIT-II

3. Solve the differential equation $(D^2-4D+4)y=8+e^{2x}+sin2x$ — 12M

(OR)

4. Solve the differential equation $(D^2-6D+9)y=\frac{e^{3x}}{x^2}$ by method of variation of parameters — 12M

UNIT-III

5. a) Prove that $\frac{d}{dx}(xJ_nJ_{n+1})=x(J_n^2-J_{n+1}^2)$ — 6M

   b) State Orthoganility relation of Legendre's function. — 6M

(OR)

6. Prove that $\int_0^1 x[J_n(\alpha x)]^2dx=\frac{1}{2}[J_{n+1}(\alpha)]^2$ — 12M

UNIT-IV

7. a) Form a partial differential equation from Z = xy + f(x^2 + y^2) . — 6M

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

(OR)

8. a) Solve $p(1+q)=qz$ — 6M

   b) Solve $x^2p^2+y^2q^2=z^2$ — 6M

UNIT-V

9. Solve $\frac{\partial^3 z}{\partial x^3}-2\frac{\partial^3 z}{\partial x^2\partial y}=2e^{2x}+3x^2y$ — 12M

(OR)

10. a) Solve $(D+1)(D+D^1-1)z=\sin(x+2y)$ — 7M

    b) Solve $(D-D^1-2)(D-D^1-3)z=e^{3x-2y}$ — 5M

AR16

CODE: 16BS1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-2021

ENGINEERING MATHEMATICS – II

(Common to all branches)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Using Newton-Raphson method find a root of the equation $xe^x - 2 = 0$ correct upto 3 decimal places. 6 M

   b) Find the polynomial which takes the following values 8 M

x:	0	1	2	3
y:	1	2	1	10

   Hence, find the value of y at x = 4

(OR)

2. a) Find the Lagranges interpolation polynomial from the following data 6 M

x:	5	6	9	11
y:	12	13	14	16

   Hence, find the value of y at x = 10

   b) Prove the following 8 M

   $i).\quad E = e^{hD}$

   $ii).\ \mu^2 = 1 + \frac{\delta^2}{4}$

UNIT-II

3. a) Find the the value of the First derivative of f(x) at x = 6 from the following data 7 M

x :	0	2	3	4	7	8
f(x) :	4	26	58	112	466	922

   b) Using Simpson's 1/3 rule, evaluate $\int_0^6 \frac{e^x}{1+x}dx$ by taking h = 1 7 M

(OR)

4. Using Runge – Kutta method of order four , find y (0.2) for the equation 14 M

$$\frac{dy}{dx} = \frac{y-x}{y+x}, \quad y(0) = 1, \text{ take } h = 0.2$$

UNIT-III

5. a) Find $L\left(\int_0^t \frac{e^{-t}\sin t}{t}\,dt\right)$ 6 M

b) Using Convolution theorem, find $L^{-1}\left(\frac{s}{(s^2+4)(s^2+9)}\right)$ 8 M

(OR)

6. a) Using Laplace transforms , solve the differential equation 8 M
$(D^2-2D+2)y=4e^{2t}$, $where \ y(0)=-3, y'(0)=5$

b) Find $L^{-1}\left(\frac{s+2}{(s^2+4s+5)^2}\right)$ 6 M

UNIT-IV

7. a) Find Fourier Series of f (x) = x in the interval (-1 , 1) 7 M

b) 7 M

Given $f(x)=\begin{cases} 1+\frac{2x}{\pi} & if\ -\pi\le x\le 0 \\ 1-\frac{2x}{\pi} & if\ \ 0\le x\le \pi \end{cases}$

Is the function is even (or) odd? Find the Fourier series of f(x) and deduce
$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.....=\frac{\pi^2}{8}$

(OR)

8. a) Expand f(x) = x sin x as a Fourier series in the interval (0 , 2π) 7 M

b) Find Half range Fourier Sine series of $f(x) = x^2$ the interval (0 , 1) 7 M

UNIT-V

9. a) Form Partial Differential Equation by eliminating arbitrary function f from $f(x^2+y^2, z-xy)=0$ 4 M

b) i). Solve $x(y-z)p+y(z-x)q=z(x-y)$ 10 M

ii). Solve the Partial Differential Equation
$\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$, given that $u(x,0)=6e^{-3x}$ by using method of separation of variables

(OR)

10. a) Solve $4\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial x\partial y}+\frac{\partial^2 z}{\partial y^2}=e^{x+y}$ 6 M

b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2}$ under the conditions $u(0,t)=0,\ \ u(l,t)=0$ 8 M

for all t , $u(x,0)=f(x)\ and\ \left(\frac{\partial u}{\partial t}\right)_{t=0}=g(x)$, $0<x<l$

AR13

CODE: 13BS1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, February-2021

ENGINEERING MATHEMATICS -III
(Common to EEE & ECE)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) The rank of the matrix $\begin{bmatrix} k & -1 & 0 \\ 0 & k & -1 \\ -1 & 0 & k \end{bmatrix}$ is 2 then k = ----

   b) Write the statement of Cayley Hamilton theorem

   c) The eigen values of A are -1, -4, -4 then the nature of the quadratic form is

   d) The symmetric matrix associated with the quadratic form $ax^2 + 2hxy + by^2$

   e) What are the conditions required to express a function $f(x)$ as a Fourier series

   f) Write the change of scale property for Fourier Transform

   g) Find the Z-Transform of $\sin(3n+5)$

   h) Write the Damping rule for Z-Transform

   i) Define Gamma function

   j) Find the value of $\beta\left(\frac{9}{2}, \frac{7}{2}\right)$

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2 Discuss for what values of λ, μ the simultaneous equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. 12M

(OR)

3. a) Reduce the matrix $\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ to normal form and hence find the rank 6M

   b) Find whether the following system of equations are consistent, if so solve them. 6M
   $x + y + 2z = 4,\ 2x - y + 3z = 9,\ 3x - y - z = 2$

UNIT-II

4. a) Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 5 & -2 & 0 \\ -2 & 6 & 2 \\ 0 & 2 & 7 \end{bmatrix}$ 8M

   b) Write down the quadratic form corresponding to the matrix $\begin{bmatrix} 0 & 5 & -1 \\ 5 & 1 & 6 \\ -1 & 6 & 2 \end{bmatrix}$ 4M

(OR)

5. Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 12M

UNIT-III

6. Find the Fourier series for f(x), if $f(x)=\begin{cases} -\pi & -\pi<x<0 \\ x & 0<x<\pi \end{cases}$ and deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+----$ 12M

(OR)

7. a) Obtain the Fourier expansion of $x\sin x$ as a cosine series in $(0,\pi)$. Hence show that $\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+.........=\frac{\pi-2}{4}$ 6M

b) Show that (i) $F_s[xf(x)]=-\frac{d}{ds}[F_c(s)], F_c[xf(x)]=\frac{d}{ds}[F_s(s)]$ 6M

(ii) Find the Fourier sine and cosine transform of xe^{-ax}

UNIT-IV

8. a) State and prove final value theorem for Z-Transforms 6M

b) Find the inverse Z-Transform of $\frac{z}{(z+3)^2(z-2)}$ 6M

(OR)

9. a) Find $Z[(2)3^n+5n]$. And deduce $Z[(2)3^{n+3}+5(n+3)]$. 6M

b) Solve the difference equation $u_{n+2}-7u_{n+1}+12u_n=0$ given that $u_0=1$ and $u_1=2$ 6M

UNIT-V

10. a) Prove that (i) $\Gamma(n)=\int_0^1\left(\log\frac{1}{y}\right)^{n-1}dy,\ (n>0)$ 6M

(ii) $\beta(p,q)=\int_0^\infty \frac{y^{q-1}}{(1+y)^{p+q}}dy=\int_0^\infty \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx$

b) Using beta, gamma functions, show that $\int_0^1 \frac{x^2dx}{\sqrt{1-x^4}}\times\int_0^1\frac{dx}{\sqrt{1+x^4}}=\frac{\pi}{4\sqrt{2}}$ 6M

(OR)

11. a) Show that $\int_0^{\pi/2}\sqrt{\cot\theta}\,d\theta=\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta=\frac{\pi}{\sqrt{2}}$ by using the concept of beta, gamma functions 6M

b) Prove that that (i) $\beta(m,\frac{1}{2})=2^{2m-1}\beta(m,m)$ 6M

(ii) $\Gamma(m)\Gamma(m+\frac{1}{2})=\frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$

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