AR20

CODE: 20BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Regular/Supplementary Examinations, July, 2023

Differential Equations

(Common to all 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 $(8ydx + 8xdy) + x^2y^3(4ydx + 5xdy) = 0$ 5M
   b) Water at temperature 100^oC cools in 10 min to80^oC in a room of temperature 25^oC. (a) Findthe temperature of water after 20 min. when isthe temperature (b) 40^oC. 5M

(OR)

2. a) Solve $y' + yCotx = 2x\,Cosec\,x$. 5M
   b) Find the orthogonal trajectories of the family of curves $y = c(secx + tanx)$. 5M

UNIT-II

3. Solve$(D^4 + 10D^2 + 9)y = Cos(2x + 3)$. 10M

(OR)

4. Solve $(D^2 + 1)y = \log Cosx$by the method of variationof parameters. 10M

UNIT-III

5. Find the Fourier series expansion of $f(x) = x^2$ when $0 < x < 2\pi$. Hence deduce$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots = \frac{\pi^2}{6}$. 10M

(OR)

6. Find the two half-range cosine series expansions of 10M

$$f(x) = \begin{cases} \frac{2kx}{L}, \text{when } 0 < x < \frac{L}{2} \\ \frac{2k(L-x)}{L}, \text{when } \frac{L}{2} < x < L \end{cases}$$

UNIT-IV

7. a) Find the total differential coefficient of x^2yw.r.t. x when x, y are connected by $x^2+xy + y^2 = 1$. 5M
   b) Expand $f(x, y) = x^3 + y^3 + xy^2$in powers of $(x - 1)$ and $(y - 2)$ using Taylor's series. 5M

(OR)

8. Find the shortest distance from origin to the surface $xyz^2 = 2$. 10M

UNIT-V

9. a) Form a partial differential equation by eliminating the arbitrary constants from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$. 5M
   b) Solve the partial differential equation $z(x - y) = px^2 - qy^2$. 5M

(OR)

10. a) Form a partial differential equation by eliminating the arbitrary functions from $F(ax + by + cz, x^2 + y^2 + z^2) = 0$. 5M
    b) Solve $x(y-z)\,p + y(z-x)q = z(x-y)$. 5M

UNIT-VI

11. Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{dt} + u$ where $u(x, 0) = 6\,e^{-3x}$ by the Method of Separation of variables. 10M

(OR)

12. Find the displacement of a string stretched between two fixed points at a distance 2capart when the string is initially at rest in equilibrium position and points of the string are given initial velocities v where$v = \begin{cases} \frac{x}{c}, & \text{when } 0 < x < c \\ \frac{2c-x}{c}, & \text{when } c < x < 2x \end{cases}$. 10M

x being the distance measured from one end.

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AR18

CODE: 18BST103 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July, 2023

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 $\frac{dy}{dx}+\frac{y}{x}=x^3$ 6M

   b) If the temperature of the air is $20^o C$ and the substance cools from $80^o C$ to $50^o C$ in 10 minutes, find when the temperature will be $30^o C$. 6M

(OR)

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

   b) Find the orthogonal trajectories of the family $y=ax^3$ 6M

UNIT-II

3. a) Solve $\left(D^2-2D+10\right)y=0,\ \ y\left(0\right)=4,\ \ y'\left(0\right)=1$ 6M

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

(OR)

4. $\left(D^2+4\right)y=\sec 2x$ by the method of variation of parameters 12M

UNIT-III

5. Prove that $\left(1-2xt-t^2\right)^{-1/2}=\sum_{n=0}^{\infty}t^nP_n\left(x\right)$ 12M

(OR)

6. Prove that $J_{n-1}(x)=\frac{n}{x}J_n(x)+J_n^{\prime}(x)$ 12M

UNIT-IV

7. a) Form a partial differential equation by eliminating arbitrary constants from $z=ax+by+\frac{a}{b}$ 6M

   b) Form a partial differential equation by eliminating arbitrary function from $f\left(x^2+2yz,y^2+2xz\right)=0$ 6M

(OR)

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

   b) Solve $p^2+q^2=x+y$ 6M

UNIT-V

9. Solve $\left(D^2+4DD'+4D'^2\right)z=e^{x-y}$ 12M

(OR)

10. Solve $\left(D^3-7DD'^2-6D'^3\right)z=\sin\left(2x+y\right)$ 12M

AR18

CODE: 18BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July, 2023

DIFFERENTIAL EQUATIONS AND TRANSFORMTHEORY

(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 $\frac{dy}{dx} = \frac{x(2\log x+1)}{\sin y + y\cos y}$. 6M

b) Solve $\frac{dy}{dx} = e^{3x-2y.}$ 6M

(OR)

2\. Solve $(1 + 2\text{xy}\cos x^2 - 2xy)\text{dx} + (\sin x^2 - x^2)\text{dy} = 0$ 12M

UNIT-II

3\. Find a Fourier series to representx^2in the interval$(-l, l)$ 12M

(OR)

4\. a) Find the complex form of the Fourier series of Fourier series of $f(x) = e^{-x}$ in $-1 \leq x \leq 1$ 6M

b) Express $f(x) = x\ as\ a\ half\ range\ size\ series\ in\ 0 < x < 2.$ 6M

UNIT-III

5\. Find the Fourier transform of $f(x) = \begin{Bmatrix} 1\ for\ |x| < 1 \\ 0\ for\ |x| > 1 \end{Bmatrix}$ 12M

Hence evaluated $\int_0^\infty \frac{\sin x}{x} dx$

(OR)

6\. Using finite Fourier transform, solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ givenand u(x,0)=2x $\text{u}(0,\text{t}), \text{u}(4,\text{t}) = 0$ where $0 < x < 4, t > 0$. 12M

UNIT-IV

7\. a) Find the Laplace transform of the function $f(t) = \begin{cases} Esin\ \omega t, & 0 < t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega}, \end{cases}$ 6M

b) Evaluate $L^{-1}\left\{\frac{e^{-s}-3e^{-3s}}{s^2}\right\}$. 6M

(OR)

8\. a) Find the inverse transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ 6M

b) Find the Laplace transform of the function $f(t) = |t-1| + |t+1|$ 6M

UNIT-V

9\. a) Find the Z-transform of the following : $(i)\ 3n - 4\sin\frac{n\pi}{4} + 5a$; (ii)$(n+1)^2$ 6M

b) Use convolution theorem to evaluate $Z^{-1}\left\{\frac{z^2}{(z-a)(z-b)}\right\}$ 6M

(OR)

10\. a) Find the inverse Z-transform of $\frac{z}{(z+1)^2}$by division method. 6M

b) Find the inverse Z-transform of $\frac{2z}{[(z-1)(z^2+1)]}$ 6M

AR16

CODE: 16BS1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July, 2023

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 at one place

UNIT-I

1. a Determine $f(1.6)$ using Newton's forward difference formula, from the following data **7M**

x	1	1.4	1.8	2.2
$f(x)$	3.49	4.82	5.96	6.5

b Compute $f(10)$ such that $f(1)=168, f(7)=192, f(15)=336$ using Lagrange's interpolation formula. **7M**

(OR)

2. a Compute a real root of $x^4-32=0$ correct to 4 decimal places by Regula Falsi method **7M**

b Compute a real root of the equation $3x=\cos x+1$ by Newton Raphson method **7M**

UNIT-II

3. a Evaluate $\int_1^2 \frac{dx}{x}$ by using Simpson's $\frac{1}{3}$ rule with $n=10$ **7M**

b Determine $f'(25)$ using Newton's backward difference formula, from the following data **7M**

x	15	17	19	21	23	25
$f(x)$	3.873	4.123	4.359	4.583	4.796	5.8

(OR)

4. a Solve $\frac{dy}{dx}=x(1+y)$ with $y(1)=1$ at $x=1.1$by Modified Euler's method taking $h=0.05$ **7M**

b Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ with $y(0)=1$ at $x=0.2,\ 0.4$ **7M**

UNIT-III

5. a Find the Laplace transform of $\sinh 3t \cos^2 t$ **7M**

b Find $L^{-1}\left\{\frac{s}{(s+3)^2+4}\right\}$ **7M**

(OR)

6. a Evaluate $\int_0^\infty \frac{e^{-\sqrt{2}t}\sinh t\sin t}{t}dt$by using Laplace transform **7M**

b Solve $(D^2+\omega^2)y=\cos\omega t$ given that $y=Dy=0$ at$t=0$ by using Laplace transform method. **7M**

UNIT-IV

7. a Determine the Fourier series for $f(x)=|x|$ in $(-\pi,\pi)$ **7M**

b Determine the half range sine series $f(x)=e^x$ in $(0,1)$ **7M**

(OR)

8. a Obtain the Fourier series for $f(x)=\begin{cases}-\pi & for\ -\pi<x<0\\ x & for\ 0<x<\pi\end{cases}$ in $(-\pi,\pi)$ **7M**

b Express $f(x)=\begin{cases} x, & for 0<x<\frac{\pi}{2}\\ \pi-x & for\ \frac{\pi}{2}<x<\pi\end{cases}$ as Fourier cosine series in $(0,\pi)$ **7M**

UNIT-V

9. a Solve the partial differential equation $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$ **7M**

b Solve $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ and $u=e^{-5y}$ when $x=0$for all values of y **7M**

(OR)

10. Solve the one dimensional wave equation $\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial x^2}$ subject to $y(0,t)=0,\ y(\pi,t)=0, y(x,0)=\sin 2x$ and $\frac{\partial y}{\partial t}(x,0)=0$, where $0\le x\le\pi$ and $t\ge 0$ **14M**

AR13

CODE: 13BS1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

I B.Tech II Sem Supplementary Examinations, July, 2023

ENGINEERING MATHEMATICS -III
(Common to CE, ME, CSE, IT, ECE & EEE)

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

PART-A

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

1. a) Reduce the matrix $\begin{bmatrix} 1 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix}$ to echelon form

   b) Determine the rank of the matrix $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

   c) If the sum of the eigen values of $\begin{bmatrix} 3 & 4 & 5 \\ 2 & a & 4 \\ 1 & 2 & 5 \end{bmatrix}$ is 10, then find $'a'$.

   d) Write the real symmetric matrix of the Quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$

   e) Define Fourier transform

   f) Find the Fourier coefficient $'a_0'$ in the Fourier series expansion of $f(x) = |\cos x|, -\pi < x < \pi$.

   g) Determine the Z-transform of $n^2 3^n$

   h) State Damping rule of Z- transform

   i) Determine the value of $\Gamma(\frac{5}{2})$

   j) Define Beta function

PART-B

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

UNIT-I

2. a) Reduce the matrix $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ into normal form. Hence find its rank **6M**

   b) Find the value of $'b'$ such that the system $2x + y + 2z = 0,\ x + y + 3z = 0,\ 4x + 3y + bz = 0$ has non trivial solutions **6M**

(OR)

3. a) Apply Gauss elimination method to solve the system of equations $2x + 4y + z = 3,\ 3x + 2y - 2z = -2,\ x - y + z = 6$ **6M**

   b) Solve the equations $3x + 2y + 7z = 4,\ 2x + 3y + z = 5,\ 3x + 4y + z = 7$ by Gauss-Jordan method **6M**

UNIT-II

4. a) If $A=\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$, find A^{-1} using Cayley-Hamilton theorem **6M**

b) Find Eigen values and Eigen vectors of the matrix $A=\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ **6M**

(OR)

5. Reduce the quadratic form $3x^2+3y^2+3z^2+2xy+2xz-2yz$ to canonical form by an orthogonal transformation **12M**

UNIT-III

6. a) Find the Fourier series for $f(x)=e^x$, $0<x<2\pi$. **6M**

b) Find Fourier sine transform of $e^{-|x|}$. Hence show that $\int_0^\infty \frac{x\sin mx}{1+x^2}dx=\frac{\pi e^{-m}}{2}$ **6M**

(OR)

7. a) Find the half-range sine series for $f(x)=\pi x-x^2$, in $0<x<\pi$ **6M**

b) Find the Fourier transform of $f(x)=\begin{cases} 1, & \text{for } |x|<1 \\ 0, & \text{for } |x|>1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin x}{x}dx$ **6M**

UNIT-IV

8. a) Find $Z[n\sin n\theta]$ **6M**

b) If $\bar{f}(z)=\frac{2z^2+5z+14}{(z-1)^4}$, find the values of $f(2)$ and $f(3)$ by Initial value theorem **6M**

(OR)

9. a) Determine the inverse Z-transform of $\frac{z^2}{z^2-4z+3}$ by convolution theorem **6M**

b) Using Z – transform, solve $u_{n+2}+4u_{n+1}+3u_n=3^n$ with $u_0=0,\ u_1=1$ **6M**

UNIT-V

10. a) Show that $\beta(p,q)=\int_0^1 \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx$ **6M**

b) Prove that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$ **6M**

(OR)

11. a) Show that $\Gamma(n)\Gamma\left(n+\frac{1}{2}\right)=\frac{\sqrt{\pi}}{2^{2n-1}}\Gamma(2n)$ for suitable value of n **6M**

b) Compute $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta}\, d\theta$ using Beta and Gamma functions **6M**

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