AR20

CODE: 20BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

Differential Equations

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 $(xe^{xy}+2y)\frac{dy}{dx}+ye^{xy}=0.$ **5M**

   b) Find the Orthogonal Trajectories of the family of curves $x^2+y^2=a^2$ **5M**

(OR)

2. a) Solve $\frac{dy}{dx}+\frac{y}{x\log x}=\frac{\sin 2x}{\log x}.$ **5M**

   b) A body kept in air with temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C. **5M**

UNIT-II

3. (a) Solve: $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=e^{2x}$. **5M**

   (b) Using the method of variation of parameters, solve $\frac{d^2y}{dx^2}+4y=\tan 2x$ **5M**

(OR)

4. (a) Solve the differential equation $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+5y=-2\cosh x$. Given $y(0)=0,\ y'(0)=1$ **5M**

   (b) Solve, by the method of variation of parameters, $y''-2y'+y=e^x\log x$ **5M**

UNIT-III

5. If $f(x)=\begin{cases}0, & -\pi\le x\le 0\\ \sin x, & 0\le x\le\pi\end{cases}$, prove $f(x)=\frac{1}{\pi}+\frac{\sin x}{2}-\frac{2}{\pi}\sum_{n=1}^{\infty}\frac{\cos 2nx}{4n^2-1}=\frac{\pi^2}{12}$. **10M**

   Hence, show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-.....-\infty=\frac{1}{4}(\pi-2)$

(OR)

6 Obtain the Fourier expansion of $x\sin x$ as a cosine series in $(0,\pi)$. **10M**

   Hence show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-.......\infty=\frac{\pi-2}{4}$.

UNIT-IV

7. (a) Expand e^{xy} in the neighbourhood of (1, 1) **5M**

(b) Find the points on the surface $z^2 = xy+1$ that are nearest to the origin. **5M**

(OR)

8. a) Expand the function $f(x, y) = e^x \log(1+y)$ in terms of x and y up to the terms of 3rd degree using Taylor's theorem. **5M**

b) Find the stationary points of $u(x, y) = \sin x \sin y \sin(x+y)$ where $0 < x < \pi,\ 0 < y < \pi$ find the maximum u. **5M**

UNIT-V

9. a) Form the partial differential equation by eliminating the arbitrary functions from $z = (x+y)\phi(x^2 - y^2)$ **5M**

b) Solve $x^2 p^2 + y^2 q^2 = z^2$ **5M**

(OR)

10. Solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$ **10M**

UNIT-VI

11. A tightly stretched string of length l with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity $v_0 \sin^3 \frac{\pi x}{l}$. Find the displacement $y(x,t)$. **10M**

(OR)

12. Solve the differential equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ for the conduction of heat along a rod without radiation, subject to the conditions (i) u is not infinite for $t \to \infty$,
(ii) $\frac{\partial u}{\partial x} = 0 \ for\ x = 0\ and\ x = l$ and
(iii) $u = lx - x^2\ for\ t = 0,\ between\ x = 0\ and\ x = l$ **10M**

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AR18

CODE: 18BST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Suppl. Examinations, September, 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 $\frac{dy}{dx}+\frac{y}{x}=x^3y^2$	6M
	b)	If the temperature of the air is 30^oC and the substance cools from 80^oC to 60^oC in 12 minutes, find when the temperature of the body after 24 minutes.	6M
		(OR)	
2.	a)	Solve $x^2y\,dx-\left(x^3+y^3\right)dy=0$	6M
	b)	Find the orthogonal trajectories of the family $r=a\cos\theta$	6M

UNIT-II

3.	a)	Solve $\left(D^2-5D+6\right)y=0,\ \ y(0)=1,\ \ y'(0)=1$	6M
	b)	Solve $\left(D^2+2D+3\right)y=x^2$	6M
		(OR)	
4.		$\left(D^2+4\right)y=\tan 2x$ by the method of variation of parameters	12M

UNIT-III

5.		State and prove orthogonal property of Bessel functions	12M
		(OR)	
6.		Show that $np_n(x)=xp'_n(x)-p'_{n-1}(x)$	12M

UNIT-IV

7.	a)	Form a partial differential equation by eliminating arbitrary constants from $z=ax+by+a^2+b^2$	6M
	b)	Form a partial differential equation by eliminating arbitrary function from $f\left(x+y+z,\ x^2+y^2+z^2\right)=0$	6M
		(OR)	
8.	a)	Solve $x(y-z)p+y(z-x)q=z(x-y)$	6M
	b)	Solve $z=p^2+q^2$	6M

UNIT-V

9.		Solve $\left(D^2+5DD'+6D'^2\right)z=e^{3x+4y}$	12M
		(OR)	
10.		Solve $\left(D^2-6DD'^2+9D'^2\right)z=\cos\left(2x+y\right)$	12M

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AR18

CODE: 18BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Suppl. Examinations, September, 2023

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 $\frac{dy}{dx} = (4x + y + 1)^2, if\ y(0) = 1.$ 6M

b) Solve $\frac{y}{x}\frac{dy}{dx} + \frac{x^2+y^2-1}{2(x^2+y^2)+1} = 0$ 6M

(OR)

2. a) Solve $\frac{dy}{dx} + \frac{y\cos x+\sin y+y}{\sin x+x\cos y+x} = 0$ 6M

b) Solve $(x^2\text{y} - 2\text{x}y^2)\text{dx} - (x^3 - 3x^2\text{y})\text{dy} = 0$ 6M

UNIT-II

3. If $\text{f(x)} = |\cos x|$, expand $f(x)\ as\ a$ Fourier series in the interval $(-\pi, \pi)$. 12M

(OR)

4. a) Obtain the Fourier series for $y = x^2$ in $-\pi < x < \pi$. Using the two values of y, show that $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \cdots, = \frac{\pi^4}{90}$ 6M

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

UNIT-III

5. a) Find the Fouriercosine transform of e^{-x^2}. 6M

b) If the Fourier sine transform of $f(x) = \frac{1-\cos n\pi}{n^2\pi^2}(0 \le x \le \pi)$find$f(x)$. 6M

(OR)

6. Using finite Fourier transform, solve $\frac{\partial u}{\partial t} = \frac{2\partial^2 u}{\partial x^2}$ given and $(0, t) = 0, \text{u(x}, 0) = e^{-x}(x > 0), u(x, t)$ is bounded where $\text{x} > 0,\ t > 0$. 12M

UNIT-IV

7. a) An impulsive voltage E$\delta(t)$ is applied to a circuit consisting of L, R, C in series with zero initial conditions. If i be the current a any subsequent time t, find the limit of i as $t \rightarrow 0$? 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 $f(t) = [t]$where [] stands for the greatest integer function. 6M

UNIT-V

9. a) Find the Z-transform of the following : (i) n sin $n\theta$; (ii)$n^2e^{n\theta}$. 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 log$\left(\frac{z}{z+1}\right)$ by power series method. 6M

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

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AR16

CODE: 16BS1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Suppl. Examinations, September, 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 Compute a real root of $x^3 - 2x - 5 = 0$ correct to 3 decimal places by Regula Falsi Method **7M**

   b Compute a real root of the equation $x^4 - x - 10 = 0$ by Newton Raphson method **7M**

(OR)

2. a Compute $y(17)$ using Newton's backward difference formula, from the following data **7M**

x	8	10	12	14	16	18
y	10	19	32.5	54	89.5	15.4

   b Find the polynomial such that $f(1) = 9, f(4) = 18, f(12) = 130$ using Lagrange's interpolation formula. **7M**

UNIT-II

3. a Using Taylor's method, solve $\frac{dy}{dx} = 2y + 3e^x$ with $y(0) = 0$ at $x = 0.2$ **7M**

   b Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}$ with $y(1) = 0$ at $x = 1.2, 1.4$ **7M**

(OR)

4. a Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule **7M**

   b Determine $f'(50)$ using Newton's forward difference formula, fro the following data **7M**

x	50	55	60	65
$f(x)$	1.6990	1.7404	1.7782	1.8129

UNIT-III

5. a Find the Laplace transforms of the function $f(t) = e^{-t}\sin^2 t$ **7M**

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

(OR)

6. a Find the Laplace transform of the full wave rectifier function defined by $f(t) = E\ \sin\omega t\ if\ \ 0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$. **7M**

   b Solve $\frac{d^4y}{dt^4} - k^4y = 0,$ where $y(0) = 1, y'(0) = y''(0) = y'''(0) = 0$ by using Laplace transform method. **7M**

UNIT-IV

7. a Obtain the Fourier series for $f(x) = 1 - x^2$ in $(-1,1)$ **7M**

   b Obtain the half range cosine series $f(x) = (x-1)^2$ in $(0,1)$ **7M**

(OR)

8. a Determine the Fourier series for $f(x) = x - x^2$ in $(-\pi,\pi)$ **7M**

   b Obtain the half range sine series $f(x) = x$ in $(0,2)$ **7M**

UNIT-V

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

   b Solve $y\frac{\partial u}{\partial x} + x\frac{\partial u}{\partial y} = 3u$ and $u(x,0) = e^{x^2}$ by the method of separation of variables **7M**

(OR)

10. a Find a partial differential equation from $z = f(x+at) + g(x-at)$ **7M**

    b The ends A and B of a rod of 20 cm long, have the temperature at $30^\circ C$ and $80^\circ C$ until steady state prevails. The temperature of the ends are changed to $40^\circ C$ and $60^\circ C$ respectively. Find the temperature distribution in the rod at time t **7M**

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