AR23

CODE: 23BHT103 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Regular/Supplementary Examinations, June , 2025
Differential Equations and Vector Calculus
(Common to CIVIL, CSD, CSE, AIML, ECE, EEE, IT, ME.)

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

Q.No.		Question	Marks	CO	Blooms Level
		UNIT-I			
1.	a)	Solve $y' = 4y + 2x - 4x^2$.	7M	CO1	K3
	b)	The number *N* of bacteria in a culture grew at a rate proportional to *N*. The value of *N* was initially 100 and increased to 332 in one hour, what would be the value of *N* after 1 ½ hours.	7M	CO1	K3
		(OR)			
2.	a)	Solve $3y' + xy = xy^{-2}$.	7M	CO1	K3
	b)	If a substance cools from $370k$ to$330k$ in $10mts$, when the temperature of the surrounding air is $290k$, find the temperature of the substance after $40mts$.	7M	CO1	K3
		UNIT-II			
3.	a)	Solve $y'' - 2y' + 5y = 0, y(0) = -3, y'(0) = 1$.	7M	CO2	K3
	b)	Solve $(D^2 + 4)y = \sin 3x + \cos 2x$.	7M	CO2	K3
		(OR)			
4.		Solve the differential equation $(D^2 - 3D + 2)y = \frac{1}{1+e^{-x}}$ by the method of variation of parameters.	14M	CO2	K3
		UNIT-III			
5.	a)	Describe (obtain) partial differential equation by eliminating the arbitrary constants from $z = axe^y + \frac{1}{2}a^2e^{2y} + b$.	7M	CO3	K1
	b)	Find the solution of $p - q = \ln(x + y)$.	7M	CO3	K1
		(OR)			
6.	a)	Find the solution of $p^2z^2 + q^2 = 1$.	7M	CO3	K1
	b)	Find the solution of $(D_x^2 - D_xD_y - D_y^2)z = 0$.	7M	CO3	K1
		UNIT-IV			
7.	a)	Compute the magnitude of velocity and acceleration at $t = 0$ of a particle moving along a curve whose parametric equations are$x = e^{-t},\ y = 2\cos 3t,\ z = 2\sin 3t$; where *t* is the time.	7M	CO4	K2
	b)	Compute $curl$ of $xyz^2i + yzx^2j + zxy^2k$ at the point $(1, 2, 3)$.	7M	CO4	K2
		(OR)			
8.		If $\bar{A} = 2x^2i - 3yz\,j + xz^2k$ and $f = 2z - x^3y$ then Compute (i) $A \cdot \nabla f$ (ii) $A \times \nabla f$ at the point $(1, -1, 1)$.	14M	CO4	K2
		UNIT-V			
9.		Verify Green's theorem in plane for$\oint_c (xy + y^2)dx + x^2dy$where c is the boundary of the region defined by $y = x$and$y = x^2$.	14M	CO5	K5
		(OR)			
10.		Verify Gauss divergence theorem for $\bar{A} = 4xi - 2y^2j + z^2k$ taken over the region bounded by $x^2 + y^2 = 4, z = 0$ and $z = 3$.	14M	CO5	K5

AR20

CODE: 20BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, June,2025

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 $(1+x^2)dy = (e^{\tan^{-1}x} - y)dx$ 5 M

b) If a substance cools from 370k to 330k in 10minutes, when the temperature of the surrounding air is 290k, find the temperature of the substance after 40minutes. 5 M

(OR)

2. a) Solve $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0.$ 5 M

b) The temperature of a body cools from 100^oC to 70^oC in 15 minutes, the temperature of the air is maintained at 40^oC. Find the temperature of the body after 30 minutes. 5 M

UNIT-II

3. Solve $(D^2 - 6D + 25)y = e^{2x}\sin x + x.$ 10 M

(OR)

4. Solve, by the method of variation parameters, $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x logx$ 10 M

UNIT-III

5. Find the Fourier series of $f(x) = x^2$ in the interval $-\pi < x < \pi$. 10 M

(OR)

6. Find the half-range Fourier sine and cosine series of $f(x) = x^2$ in the interval $0 < x < \pi$. 10 M

UNIT-IV

7. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. 10 M

(OR)

8. Find the maximum and minimum values of the function $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$. 10 M

UNIT-V

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

b) Solve $xp + yq = 3z$. 5 M

(OR)

10. a) Form partial differential equation from the equation $z = f(x^2 - y^2)$ by eliminating the arbitrary function f. 5 M

b) Solve $z = px + qy + \sin(p+q)$. 5 M

UNIT-VI

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

(OR)

12. 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 $v_0\sin^3(\pi x/\boldsymbol{l})$.Find the displacement $y(x,t)$ 10 M

AR18

CODE:18BST102 **SET-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.TECH II SEM SUPPLEMENTARY EXAMINATIONS, JUNE,2025
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) Show that the particular solution of $(x^2+1)\frac{dy}{dx}+(y^2+1)=0.,y(0)=1, is\ y=\frac{1-x}{1+x}$ [6M]

b) Solve the following equation$(2x^2+3y^2-7)x\,dx+(3x^2+2y^2-8)y\,dy.$ [6M]

(OR)

2. a) Solve :$\cos x\,dy=y(\sin x-y)dx.$ [6M]

b) Solve $(xy^2+y)dx-dy=0$ [6M]

UNIT-II

3. a) Write Down Four method of obtaining Fourier seriesof $f(x)$. [6M]

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

(OR)

4. a) Find the Fourier series of $f(x)$ defined $f(x)=\begin{cases}0 & when \quad -c<x<0\\ 1 & when \quad 0<x<c\end{cases}$ find the value of Fourier series at the point of discontinuity$x=0$. [6M]

b) Obtain the Fourier series expansion of $f(x)=x.\cos\left(\frac{\pi x}{L}\right)$ in the interval $-L\le x\le L$. [6M]

UNIT-III

5. a) The Fourier transform of the convolution of f *and* g is the product of their Fourier transforms [6M]

b) Represent $f(x)$ as an exponential Fourier transform when, [6M]
$f(x) = \begin{cases} \sin x, & 0 < x < \pi \\ 0, & otherwise \end{cases}$ *showthat* the result can be written as $f(x) = \frac{1}{\pi}\int_0^\infty \frac{\cos\alpha x + \cos\alpha(x-\pi)}{1-\alpha^2}\, d\alpha.$

(OR)

6. a) Find the inverse Fourier *sine* transform of $\frac{1}{s}e^{-as}$. [6M]

b) Find $f(x)$ whose Fourier cosine transform is $\frac{\sin as}{s}$. [6M]

UNIT – IV

7. a) Solving $[3t^2 - 2t^4 + 4e^{-5t} - 3\sin 6t + 4\cos 4t]e^{2t}$. [6M]

b) Solve $g(t) = \begin{cases} 0, & 0 < t < 5 \\ t-3, & t > 5 \end{cases}$ by using *t-shift theorem.* [6M]

(OR)

8. a) Solve : $L\left\{\int_0^t ue^{-u}.\sin 4u\, du\right\}$ [6M]

b) Solve: $\frac{s^3-3s^2+6s-4}{(s^2-2s+2)^2}$ [6M]

UNIT-V

9. a) State and Prove convolution theorem in Z transforms [6M]

b) Find the inverse Z-transform of $\left(\frac{z}{z-a}\right)^3$ by using convolution theorem. Deduce for $\left(\frac{z}{z-a}\right)^3$. [6M]

(OR)

10. a) Solve the difference equation $u_{n+1} - 4u_{n+1} + 3u_n = 5^n$ by using Z-transform, [6M]

b) Find $z^{-1}\{(z-5)^{-3}\}$ when |z|>5. Determine the region of convergence. [6M]

AR16

CODE:16BS1002 **SET-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, June,2025

ENGINEERINGMATHEMATICS – II

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) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places [7M]

b)Find the newton's method, the real root of the equation $3\text{x} = \cos x + 1$. [7M]

(OR)

2. Apply Newton's forward difference formula to construct a polynomial for the given data and hence find y for x = 5: [14M]

x:	4	6	8	10
y:	1	3	8	16

UNIT-II

3. Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Trapezoidal rule using 11 coordinates. [14M]

(OR)

4. a) Find an approximately value of y when $x = 0.3$, given that $\frac{dy}{dx} = x + y$ and $\text{y} = 1$ when $\text{x} = 0$. [7M]

b) Find an approximate value of y when $\text{x} = 0.2$, given that $\frac{dy}{dx} = x + y$ and $\text{y} = 1$ when $\text{x} = 0$ by using Runge-Kutta fourth order method. [7M]

UNIT-III

5. a) Show that $L(t\ sint\ at) = \frac{2as}{(s^2+a^2)^2}$ and $L(t\ cost\ at) = \frac{(s+ia)^2}{(s^2+a^2)^2}$ [7M]

   b) Find the inverse Laplace transform of: (i) $\frac{s^2}{(s-2)^3}$, (ii)$\frac{s+2}{(s^2-4s+13)}$ [7M]

(OR)

6. Find $L^{-1}\left[\frac{11s^2-2s+5}{(s+1)(s-2)(2s-1)}\right]$. [14M]

UNIT-IV

7. a) Find the Fourier cosine transform ofe^{-x^2}. [7M]

   b) Solve the integral equation $\int_0^\infty f(\theta) cos\ \alpha\theta\ d\theta = \begin{cases} 1-\alpha\ , 0 \le \alpha \le 1 \\ 0 \qquad , \alpha > 1 \end{cases}$ hence evaluate $\int_0^\infty \frac{sin^2 t}{t^2}\ dt.$ [7M]

(OR)

8. Find the half – range cosine and sine series for the function $f(x) = (x-1)^2$ in the interval.

   Hence show that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ... = \frac{\pi^2}{8}$. [14M]

UNIT-V

9. a) Solve $q^2 = z^2p^2(1-p^2)$. [7M]

   b) Find the differential equation of all planes which are at a constant distance a from the origin. [7M]

(OR)

10. Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y}$ + 2u and u = 0, $\frac{\partial u}{\partial x} = 1 + e^{-3y}$ when x = 0 for all values of y [14M]