AR20

CODE: 20BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Regular/Supplementary Examinations, August, 2022

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 $(xy\,Sinxy + Cosxy)ydx + (xySinxy - Cosxy)xdy = 0$ **5M**
   b) A thermometer reading 18^oF is brought into a room the temperature of which is 70^oF. One minute later the thermometer reading is 31^oF. Find the temperature reading 5 minutes after the thermometer is first brought into the room. **5M**

(OR)

2. a) Solve $y' + 2y = 3e^x Sin2x$. **5M**
   b) Find the orthogonal trajectories of the family of curves $r = acos2\theta$. **5M**

UNIT-II

3. Solve$(D^2 - 4D - 5)y = e^{3x} + 3cos(4x + 3)$. **10M**

(OR)

4. Solve $(D^2 + 1)y = cosecx$ by the method of variation of parameters. **10M**

UNIT-III

5. Find the Fourier series expansion of the Half wave rectifier **10M**
   $f(t) = \begin{cases} a\,Sint, if\ 0 \le t \le \pi \\ 0, \pi \le t \le 2\pi \end{cases}$ hence deduce $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots = \frac{1}{2}$.

(OR)

6. Find the two half-range sine series expansions of **10M**
$$f(x) = \begin{cases} \dfrac{2kx}{L}, when\ 0 < x < \dfrac{L}{2} \\ \dfrac{2k(L-x)}{L}, when\ \dfrac{L}{2} < x < L \end{cases}$$

UNIT-IV

7. Use Taylor's theorem to expand $f(x) = x^2 + xy + y^2$ in powers of $(x - 1)$ and $(y - 2)$ upto 3rd degree terms

(OR)

8. Find the maximum and minimum values of $x^2 + 2y^2 + 3z^2 - 2xy - 2yz - 2$. **10M**

UNIT-V

9. a) Form a partial differential equation by eliminating the arbitrary constants from $2z = (x^2 + a^2)(y^2 + b^2)$. **5M**
   b) Solve $zpy^2 = x(y^2 + z^2q^2)$. **5M**

(OR)

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

UNIT-VI

11. Solve $\frac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$, given that u = 0 when t = 0 and u = 0 when x = 0 by the Method of Separation of variables. **10M**

(OR)

12. A string of length L is stretched and fastened to twofixed points. Find the solution of the wave equation$y_{tt} = a^2 y_{xx}$ when the initial displacement is $y(x, 0) = f(x) = $ bSin $\left(\frac{\pi x}{L}\right)$. **10M**

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AR18

CODE:18BST102 **SET-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, August, 2022
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) 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. Obtain the Fourier series expansion of $f(x)=x^2$ in $(0,2\pi)$. [12M]

(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 . Represent $f(x)$ as an exponential Fourier transform when, [12M]

$f(x)=\begin{cases}sinx\,, & 0<x<\pi\\ 0, & otherwise\end{cases}$ $show\ that$ the result can be written as

$f(x)=\frac{1}{\pi}\int_0^{\infty}\frac{cos\alpha x+cos\alpha(x-\pi)}{1-\alpha^2}\,dx.$

(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 $\frac{sinas}{s}$. [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:$L^{-1}\left[\frac{s^3-3s^2+6s-4}{(s^2-2s+2)^2}\right]$ [6M]

UNIT-V

9. Find the inverse Z-transform of $\left(\frac{z}{z-a}\right)^2$ by using convolution theorem. [12M]

(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]

CODE: 18BST103 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August, 2022

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 $\frac{dx}{dy}-\frac{x}{y}=2y^2$. 6M

   b) Solve $(x^2y-2xy^2)\,dx-(x^3-3x^2y)\,dy = 0$. 6M

(OR)

2. a) Find the orthogonal trajectory of the family of semi cubical parabolas $ay^2 = x^3$ 6M

   b) A body originally at 80^0C cools down to 60^0C in 20 minutes, the temperature of the air being 40^0C. What will be the temperature of the body after 40 minutes from the original? 6M

UNIT-II

3. a) Solve $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=6e^{3x}+7e^{-2x}+100$ 6M

   b) Solve $(D^3-D)y=1+4\cos x+2e^x$ 6M

(OR)

4. a) Solve $y^{11}+4y^1+3y=e^{-x}$, $y(0)=y^1(0)=1$. 6M

   b) Solve by the method of variation of parameters $\frac{d^2y}{dx^2}-4y=x\sin x$ 6M

UNIT-III

5. a) Find the value of $J_{-\frac{1}{2}}(x)$. 6M

   b) Prove that $J_n^1(x)=\frac{1}{2}[J_{n-1}(x)-J_{n+1}(x)]$ 6M

(OR)

6. a) Prove that $(2n+1)P_n(x)=P_{n+1}^1(x)-P_{n-1}^1(x)$ 6M

   b) Show that $\int_{-1}^{1}P_m(x)P_n(x)dx=0, \quad if\ m\neq n$ 6M

UNIT-IV

7. a) Form the partial differential equation from $z = y\,f(x) + x\,g(y)$ by eliminating of the arbitrary functions. 6M

   b) Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$ 6M

(OR)

8. a) Form the partial differential equation from $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$ 6M

   b) Solve $p(p^2 + 1) + (b - z)q = 0$ 6M

UNIT-V

9. a) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = \cos(2x + y)$ 6M

   b) Solve $r - 4s + 4t = e^{2x+y}$ 6M

(OR)

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

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

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AR16

CODE:16BS1002 **SET-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT,TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August,2022

ENGINEERINGMATHEMATICS – 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) Find the root of the equation $x^3 - 5x + 1 = 0$, using Bisection method upto 5 stages. [7M]

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

(OR)

2. a) Find the real root of $xlog_{10}x = 1.2$ correct to five decimal places by using Newton's iterative method. [7M]

   b) The values of y are consecutive terms of series of which 23.6 is the 6th term. Find the first and tenth terms of the series: [7M]

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

UNIT-II

3. Evaluate $\int_0^1 \sqrt{1 + \text{x}^3}\ \text{dx}$, taking $\text{h} = 1$, using Trapezoidal rule and Simpson's $\frac{1}{3}$rule. [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. Using the Laplace transform, solve the differential equation $\frac{d^2y}{dt^2} + 4y = sint$, given that $y(0) = y^{/}(0) = 0$ [14M]

UNIT-IV

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

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

(OR)

8. a) Find the half range cosine series for $\mathrm{f(x) = x(2-x)}$ in $0 \le \mathrm{x} \le 2$ and hence find the sum of the series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$ [10M]

b) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2, |x| \le 1 \\ 0, \quad\quad |x| > 1 \end{cases}$

Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3}\ cos\frac{x}{2}\ dx.$ [4M]

UNIT-V

9. a) Solve $q^2 = z^2p^2(1-p^2)$. [4M]

b) From the partial differential equation by eliminating the arbitrary function f and g from $\mathrm{z = xf(ax+by) + g(ax+by)}$. [10M]

(OR)

10. a) A tightly stretched string with fixed end points $\mathrm{x} = 0$ and $\mathrm{x} = l$ is initially at rest in its equilibrium position. If each of its points is given a velocity $\lambda x(l-x)$, find the displacement of the string at any distance x from one end at any time t. [9M]

b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary condition $\mathrm{u(x,0)} = 3\sin n\pi x, u(0,t) = 0$ and $u(1,t) = 0$ where $0 < x < 1, t > 0$. [5M]

AR13

13BS1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Suppl. Examinations, August, 2022
ENGINEERING MATHEMATICS-III
(Common to All Branches)

Time: 3 hours **Max Marks:70**

PART-A

Answer all questions **[10 x 1 = 10M]**

1 (a) Define echelon form of a matrix.

(b) Find the sum and product of the eigen values of the matrix $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$.

(c) Find the matrix of the quadratic form $x^2 - 6xy + 3y^2$.

(d) State Cayley-Hamilton theorem.

(e) If $f(x) = x$ in $(-\pi, \pi)$, then find the Fourier coefficient a_2.

(f) State complex form of Fourier integral of a function..

(g) Find the finite Fourier sine transform of $f(x) = \sin ax$ in $(0, \pi)$.

(h) Find the inverse Z – transform of $\dfrac{4z}{z-a}$.

(i) Write the relation between beta and gamma functions.

(j) Evaluate $\int_0^{\pi/2} \sqrt{\cot\theta}\, d\theta$.

PART-B

Answer one question from each unit. **[5×12=60M]**

UNIT-I

2 (a) If $A = \begin{bmatrix} 1 & -1 & -1 & 2 \\ 4 & 2 & 2 & -1 \\ 2 & 2 & 0 & -1 \end{bmatrix}$, find two nonsingular matrices P and Q such that PAQ is in the normal form. **[6M+6M]**

(b) For what values of k the equations $x + y + z = 1, 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case.

(OR)

3 (a) Test the following system for consistency and if consistent solve it **[6M+6M]**
$x + 2y + z = 3,\ 2x + 3y + 2z = 5,\ 3x - 5y + 5z = 2,\ 3x + 9y - z = 4.$

(b) Express the following system in matrix form and solve by Gauss elimination method: $2x_1 + x_2 + 2x_3 + x_4 = 6,\ 6x_1 - 6x_2 + 6x_3 + 12x_4 = 36,$
$4x_1 + 3x_2 + 3x_3 - 3x_4 = -1,\ 2x_1 + 2x_2 - x_3 + x_4 = 10.$

UNIT-II

4 (a) Determine the eigen values and eigen vectors of $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$. **[6M+6M]**

(b)Verify Caley-Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

(OR)

5. Diagonalize the matrix $A=\begin{bmatrix}3 & -1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$ and hence find A^4. **[12M]**

UNIT-III

6 (a) Obtain the Fourier series to represent $f(x)=\frac{1}{4}(\pi-x)^2$ in $0<x<2\pi$. **[12M]**

Hence show that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\cdots\cdots=\frac{\pi^2}{12}$.

(OR)

7 (a) Find the Fourier series to represent $f(x)=x^2-2$, when $-2\le x\le 2$.

(b) Find the Fourier transform of $f(x)$ defined by $f(x)=\begin{cases}1-x^2, & if\ |x|\le 1\\ 0, & if\ |x|>1\end{cases}$.

Hence evaluate $\int_0^\infty \frac{x\cos x-\sin x}{x^3}\cos\frac{x}{2}\,dx$. **[6M+6M]**

UNIT-IV

8 (a) Find $Z[\cosh at\sin bt]$.

(b) Solve the difference equation using Z – transform: $u_{n+2}-3u_{n+1}+2u_n=0$ given that $u_0=0, u_1=1$. **[4M+8M]**

(OR)

9 (a) If $f(z)=\frac{2z^2+3z+4}{(z-3)^3}, |z|>3$, then find the values of $f(1)\,and\,f(2)$

(b) Using Convolution theorem, find $Z^{-1}\left[\frac{z^2}{(z-4)(z-5)}\right]$. **[6M+6M]**

UNIT-V

10 (a)Show that $\int_0^1 y^{q-1}\left(\log\frac{1}{y}\right)^{p-1}dy=\frac{\Gamma(p)}{q^p}$, where p>0, q>0.

(b) Prove that $\Gamma\left(n+\frac{1}{2}\right)=\frac{\Gamma(2n+1)\sqrt{\pi}}{2^{2n}\Gamma(n+1)}$. **[6M+6M]**

(OR)

11 (a) Show that $\beta(m,n)=\int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}dx=\int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}dx$.

(b) Evaluate $\int_0^1 x^4\left(\log\frac{1}{x}\right)^3 dx$. **[6M+6M]**

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RA / AR16

CODE: 16CE1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August, 2022

BUILDING MATERIALS AND CONSTRUCTION

(Civil Engineering)

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)	Define natural bed of a stone and discuss its importance.	7M
	b)	List out the constituents of lime stone. Explain the importance of each.	7M
		(OR)	
2.	a)	Write a note on various defects in brick work.	8M
	b)	What is meant by seasoning of timber? What are its objectives?	6M

UNIT-II

3.	a)	What are the various tests which can be performed on the cement?	8M
	b)	What is curing? What is its significance?	6M
		(OR)	
4.	a)	What are the factors affecting workability of concrete?	6M
	b)	What are the different types of mortars used for engineering works? State the composition and function of each.	8M

UNIT-III

5.	a)	What are the principles adopted in brick masonry construction?	8M
	b)	Explain the functions of structural components of building.	6M
		(OR)	
6.	a)	Explain the methods of preventing dampness.	6M
	b)	Explain the requirements of good foundation.	8M

UNIT-IV

7.	a)	Explain the construction of flat roof madras terrace roof.	7M
	b)	Define Lintel and write the function of lintel.	7M
		(OR)	
8.	a)	Write the requirements of good stair?	6M
	b)	Explain the following windows with neat sketches a) Bay window b) Corner window	8M

UNIT-V

9.	a)	Define Plastering? Give its types; Explain the procedure of plastering of new surface.	7M
	b)	Explain in brief causes and effects of dampness.	7M
		(OR)	
10.	a)	List out different types of paints. Explain with sketches various defects in paints.	6M
	b)	Write explanatory note on : Shoring and Underpinning formwork.	8M

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