AR20

CODE: 20BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, October, 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 $(2y\sin x+\cos y)dx=(x\sin y+2\cos x+\tan y)dy$. **5M**

   b) Find the Orthogonal Trajectories of the family of circles passing through origin and centre on x – axis. **5M**

(OR)

2. a) Solve $(1+y^2)dx=(\tan^{-1}y-x)dy$. **5M**

   b) An object whose temperature is 75^0C cools in an atmosphere of constant temperature 25^0C at the rate of $k\theta$, θ being the excess temperature of the body over that of the temperature. If after 10 minutes, the temperature of the object falls to 65^0C, find its temperature after20 minutes. Also find the time required to cool down to 55^0C. **5M**

UNIT-II

3. (a) Solve: $\left(D^3-6D^2+11D-6\right)y=e^{-2x}+e^{-3x}$ **5M**

   (b) Solve the method of variation of parameters, $y''-6y'+9y=\dfrac{e^{3x}}{x^2}$ **5M**

(OR)

4. (a) olve: $\left(D^2+3D+2\right)y=\sin 3x$ **5M**

   (b) Solve by the method of variation of parameters, $\dfrac{d^2y}{dx^2}-y=\dfrac{2}{1+e^x}$ **5M**

UNIT-III

5. Obtain the Fourier series for the function $f(x)$ given by

$$f(x)=\begin{cases}1+\dfrac{2x}{\pi}, & -\pi\le x\le 0\\ 1-\dfrac{2x}{\pi}, & 0\le x\le\pi\end{cases}$$. Deduce that $\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+.....=\dfrac{\pi^2}{8}$ **10M**

(OR)

6. Obtain the Fourier series for the function $f(x)$ given by

$$f(x)=\begin{cases}\pi x, & 0\le x\le 1\\ \pi(2-x), & 1\le x\le 2\end{cases}$$. Deduce that $\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+.....=\dfrac{\pi^2}{8}$ **10M**

UNIT-IV

7. (a) Expand $e^x \sin y$ in powers of x and y **5M**

(b) Find the point on the plane $3x+2y+z-12=0$, which is nearest to the origin. **5M**

(OR)

8. a) Expand $e^x \cos y$ about $\left(1, \frac{\pi}{4}\right)$. **5M**

b) Find the maximum and minimum values of $x+y+z$ subject to $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1$ **5M**

UNIT-V

9. a) Form the partial differential equation by eliminating the arbitrary functions from $z=f(x+at)+g(x-at)$. **5M**

b) Solve $p(1+q)=qz$ **5M**

(OR)

10. a) Solve $(mz-ny)\frac{\partial z}{\partial x}+(nx-lz)\frac{\partial z}{\partial y}=ly-mx$ **5M**

b) Solve $q^2=z^2p^2(1-p^2)$ **5M**

UNIT-VI

11. A tightly stretched string of length l with fixed end points x = 0 and $x=l$ is initially at rest in its equilibrium position. If it is vibrating by giving to each of its points a velocity $\lambda x(l-x)$, find the displacement of the string at any distance x from one end at any time t. **10M**

(OR)

12. Solve by the method of separation of variables, $u_x = 2u_t + u$ where $u(x,0) = 6e^{-3x}$ **10M**

AR18

CODE:18BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, October, 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 the exact equation $e^y dx+(xe^y+2y)dy=0$ [6M]

UNIT-II

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

b) Obtain the Fourier series expansion of $f(x)=(\pi-x)/2$ in $0<x<2$. [6M]

(OR)

4. a) Explain the Fourier series for Even and odd Functions [6M]

b) Expand the function $f(x)=x^3$ in the Fourier series in the interval$(-\pi,\pi)$. [6M]

UNIT-III

5. a) Explain in Fourier integral in complex Form [6M]

b) Using Fourier integral representation Show that, [6M]

$$\int_0^\infty \frac{cosx\alpha+\alpha sinx\alpha)}{1+\alpha^2}\,d\alpha.=\begin{cases}0 & if \quad x<0\\ \frac{\pi}{2} & if \quad x=0\\ \pi e^{-x} & if \quad x>0.\end{cases}$$

(OR)

6. a) Find the Fourier cosine integral $f(x) = \sin x \ if \ \ 0 \leq x \leq \pi$; 0 if $x > \pi$ [6M]

b) Find the Fourier sine integral $f(x) = \sin x \ if \ \ 0 \leq x \leq \pi$; 0 if $x > \pi$ [6M]

UNIT – IV

7. a) Find the Laplace transform of (i) $f(t) = t^{\frac{7}{2}} e^{3t}$ and (ii) $f(t) = \cosh at . cosbt$ [6M]

b) Solve: (i) $(t) = t. \cos at$,by using Laplace of transform of derivatives and (ii) $f(t) =$ $L\{\sin\sqrt{t}\} = \frac{\sqrt{\pi}}{2s^{\frac{3}{2}}} e^{-\frac{1}{4s}}$. Prove that $L\left\{\frac{cos\sqrt{t}}{\sqrt{t}}\right\} = \left(\frac{\pi}{s}\right)^{\frac{1}{2}} e^{-\frac{1}{4s}}$ [6M]

(OR)

8. a) Find Laplace theorem of the following functions (i) $f(t) = \frac{e^{-at} - e^{-bt}}{t}$ (ii)$f(t) = \frac{sin^2 t}{t}$ [6M]

b) Using for inverse Laplace transform (i) $\frac{3(s^2-2)^2}{2s^5}$; (ii) $\frac{1}{s} e^{-\frac{1}{\sqrt{s}}}$ [6M]

UNIT-V

9. a) Find the inverse Z-transform of $\frac{2(z\text{^}2-5z+6.5)}{[(z-2)(z-3)^2]}$, $for\ 2 < |z| < 3$ [6M]

b) Using Damping rule and solve: $z(\cos n\theta) = \frac{z(z-\cos\theta)}{z^2-2z\, cos\theta+1}$ [6M]

(OR)

10. a)Find $Z(u_{n+2})\ if\ \ Z(u_n) = \frac{z}{z-1} + \frac{z}{z^2+1}$, [6M]

b) Find the inverse Z-transform of $\frac{4z^2-2z}{z^3-5z^2+8z-4}$. [6M]

AR18

CODE: 18BST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, October, 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 $\cos^2 x \frac{dy}{dx} + y = \tan x$ 6M
   b) Solve $(x^4 e^x - 2mxy^2)dx + 2mx^2 y dy = 0$ 6M

(OR)

2. a) Find orthogonal trajectories of the family of curves $r^2 = a^2 \cos 2\theta$ 6M
   b) The magnitude for natural substance increases from 70 to 150 units in 15 minutes. Find the time required for the magnitude to be 225 units. Also find the magnitude of the substance after 10 minutes. 6M

UNIT-II

3. a) If $\frac{d^4 x}{dt^4} = m^4 x$, Show that $x = C_1 \cos mt + C_2 \sin mt + C_3 \cosh mt + C_4 \sinh mt$. 6M
   b) Solve $\frac{d^2 y}{dx^2} + 9y = \cos 2x$, if $y(0) = 1$, $y\left(\frac{\pi}{2}\right) = -1$ 6M

(OR)

4. a) Solve the differential equation $\frac{d^2 y}{dx^2} + y = 2\sin x$ 6M
   b) Solve by the method of variation of parameters $\frac{d^2 y}{dx^2} + y = Co\sec x$ 6M

UNIT-III

5. a) Prove that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ 6M
   b) Express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$ 6M

(OR)

6. a) Prove the recurrence relation $(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$ 6M
   b) Demonstrate $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. 6M

UNIT-IV

7. a) Form the partial differential equation by eliminating arbitrary functions from $z = f(x+at) + g(x-at)$. 6M
   b) Solve $p\tan x + q\tan y = \tan z$ 6M

(OR)

8. a) Solve $(mz - ny)\frac{\partial z}{\partial x} + (nx - lz)\frac{\partial z}{\partial y} = ly - mx.$ 6M
   b) Solve $(p^2 + q^2)y = qz$ 6M

UNIT-V

9. a) Solve $(D^2 + DD' - 6D'^2)z = \cos(2x + 3y)$ 6M

b) Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 3x^2 y$ 6M

(OR)

10. a) Solve $(D - D' - 1)(D - D' - 2)z = e^{2x-y}$ 6M

b) Solve $(D^2 + 2DD' + D'^2 - 2D - 2D')z = \sin(x + 2y)$ 6M

***

AR16

CODE: 16BS1002 **SET-II**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, October, 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 a real root of the equation $x^3 - 4x - 9 = 0$ by using bisection method correct to three decimal places [7M]

b) Find the positive root of $x^4 - x = 10$ correct to three decimal places by using newton raphson method. [7M]

(OR)

2. a) Evaluate (i) $\Delta^2\left(\frac{5x+12}{x^2+5x+16}\right)$; (ii)$\Delta^2(ab^{cx})$ [7M]

b) Following the table estimate the number of students who obtained marks between 40 and 45 [7M]

Marks	30-40	40-50	50-60	60-70	70-80
No.of Students	31	42	51	35	31

UNIT-II

3. a) Solving the Taylor's series method the equation $\frac{dy}{dx} = log(xy)$ for y(1.1) and $y(1.2)$, given$y(1) = 2$. [7M]

b) Solve $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ $with\ y(0) = 1\ at\ x = 0.2$,0.4. by using Runge-Kutta method of fourth order. [7M]

(OR)

4. a) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition y = 1 at x = 0 ; find y for x = 0.1 by Euler's method. [7M]

b) Using Euler's modified method, obtain a solution of the equation $\frac{dy}{dx} = x + |\sqrt{y}|$, with initial conditions y = 1 at x = 0, for the range $0 \le x \le 0.6$ in steps of 0.2 [7M]

UNIT-III

5. a) Find the Laplace transform of (i)$e^{-3t}(2\cos 5t - 3\ sint5t\ )$; (ii) $e^{2t}cos^2t$; (iii)$\sqrt{te^{3t}}$ [7M]

b) Evaluate $L^{-1}\left(\frac{s}{(s^2+1)(s^2+4)(s^2+9)}\right)$ [7M]

(OR)

6. a) Write down the properties of Laplace transforms. [7M]

b) Evaluate(i) $L^{-1}\frac{1}{(s^2+1)(s^2+9)}$ by using convolution theorem. [7M]

UNIT-IV

7. Expand $f(x) = xSinx$ as a Fourier series in the interval $(0,2\pi)$ [14M]

(OR)

8. a) Find the Fourier $sine$ and $cosine$ transform of x^{n-1} $, n > 0\ and\ prove\ that\ \frac{1}{\sqrt{x}}\ is\ self.$ reciprocal under Fourier *sine* and *cosine transforms.* [10M]

b) If the Fourier sine transform of $f(x) = \frac{1-cosn\pi}{n^2\pi^2}(0 \le x \le \pi), find\ f(x)$. [4M]

UNIT-V

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

b) Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$. [7M]

(OR)

10. A tightly stretched string of length l with fixed end points x = 0 and $x = l$ is initially at rest in its equilibrium position. If it is vibrating by giving to each of its points a velocity $\lambda x(l-x)$, find the displacement of the string at any distance x from one end at any time t. [14M]

RA / AR16

CODE: 16CE1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

BUILDING MATERIALS AND CONSTRUCTION

(Civil Engineering)

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

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered at one place only

UNIT-I

1.	a)	Draw a neat cross section of an exogenous tree and show various components of it	8 M
	b)	Discuss the geological classification of rocks	6 M
		(OR)	
2.	a)	Explain the composition of ordinary cement	6 M
	b)	Discuss the operation of preparation of clay for the manufacture of bricks	8 M

UNIT-II

3.	a)	Describe the process of manufacturing of glass	7 M
	b)	Write the mechanical and physical properties of reinforcing steel	7 M
		(OR)	
4.	a)	What is polymerization? Describe its methods	6 M
	b)	What are the classifications of mortars? Explain them briefly	8 M

UNIT-III

5.	a)	Explain about the Random Rubble masonry construction	8 M
	b)	Explain about the method of laying bricks	6 M
		(OR)	
6.	a)	Explain about foundation of a load bearing wall	6 M
	b)	Explain in detail about shallow foundations and deep foundations	8 M

UNIT-IV

7.	a)	What are the main components of floor? Explain the factors governing the selection for suitable type of floor	7 M
	b)	What are the general requirements of a good stair case and give different types of stairs indicating their applications?	7 M
		(OR)	
8.	a)	What are different types of doors? Give brief use of each door	7 M
	b)	With neat sketches explain various types of windows based on their method of operation?	7 M

UNIT-V

9.	a)	Briefly discuss about various types of scaffolding	7 M
	b)	Explain about the White washing, Painting and Distempering	7 M
		(OR)	
10.	a)	What is underpinning? List the circumstance under which underpinning is adopted? Explain any one method with a neat sketch	8 M
	b)	What is Plastering? What is the importance of plastering?	6 M

***

AR13

CODE: 13BS1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

ENGINEERING MATHEMATICS -III

(Common to all Branches)

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

PART-A

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

1. a) Define the rank of Matrix
   b) Define eigen values and eigen vectors
   c) Define Fourier Sine and Cosine integral formulas
   d) Write the Fourier series formula in the interval (-l,l)
   e) State Cayley – Hamilton theorem
   f) Find the rank of the matrix $\begin{bmatrix} -1 & 0 & 6 \\ 3 & 6 & 1 \\ -5 & 1 & 3 \end{bmatrix}$
   g) Write the Dirichlet conditions of Fourier series
   h) Define Beta function
   i) Write Gamma function
   j) Write the value of $Z(a^n)$

PART-B

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

UNIT-I

2. a) Define rank of the matrix ? Find the rank of the matrix by reducing it to Echelon form 6M

$$\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 3 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

   b) Determine 'b' such that the system of homogeneous equations $2x + y + 2z = 0$, $x + y + 3z = 0$, $4x + 3y + bz = 0$ has non trivial solution. Hence find the solution. 6M

(OR)

3. Analyse for what values of a, b the equations 12M
   $x + y + z = 3$, $x + 2y + 2z = 6$, $x + ay + 3z = b$ have
   i) no solution ii) a unique solution iii) an infinite number of solutions?

UNIT-II

4. Find the Eigen values of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ and the corresponding Eigen vectors. 12M

(OR)

5. Find the nature, index and signature of the quadratic form 12M
   $10x^2 + 2y^2 + 5z^2 - 4xy - 10zx + 6yz$

UNIT-III

6. Obtain the half-range Fourier cosine and sine series for the function f(x) = x in the interval $0 < x < \pi$. 12M

(OR)

7. a) Find the Fourier transform of $f(x) = e^{-x2/2}$, $\infty < x < \infty$ 6M

b) Find the fourier sin transform of $2e^{-5x} + 5e^{-2x}$ 6M

UNIT-IV

8. a) Find the Z- transform of 2^{2k+3} 6M

b) Evaluate $Z^{-1}\left\{\frac{z}{z^2+11z+24}\right\}$ 6M

(OR)

9. Solve the difference equation, using Z-transform: $u_{n+2} - 3u_{n+1} + 2u_n = 0$, $u_0 = 0$, $u_1 = 1$ 12M

UNIT-V

10. Show that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. 12M

(OR)

11. a) Evaluate $\int_0^2 (8 - x^3)^{1/3}\, dx$ using β and γ functions 6M

b) Prove that $\int_0^\infty e^{-y^{1/m}}\, dy = m\Gamma(m)$ 6M

***