AR18

CODE: 18BST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-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 $(4x^3y+4\cos(2x)\,y^{-2})dx+(3x^4-5\,y^{-2})dy=0$ **6M**

   b) Show that the family $y^2=4a(x+a)$, where 'a' is a parameter, is self-orthogonal **6M**

(OR)

2. Find the orthogonal trajectories of the family $r^2=a\cos 2\theta$, where 'a' is a parameter. **12M**

UNIT-II

3. a) Solve: $y'''-2y''+4y'-8y=8\sin 2t$ **6M**

   b) Solve: $y''-2y'-3y=-3te^{-t}$ **6M**

(OR)

4. a) Solve: $y'''-3y''+3y'-y=e^x$ **6M**

   b) Solve: $y''-6y'+9y=\dfrac{e^{3t}}{t^2}$ **6M**

UNIT-III

5. Show that $\int_{-1}^{1} x^n P_n(x)dx=\dfrac{2^{n+1}(n!)^2}{(2n+1)!},\ n\in\square$. **12M**

6. a) Find $P_n(0),\ n\in\square$ **6M**

   b) Show that $J_n'(x)=\dfrac{n}{x}J_n(x)-J_{n+1}(x)$ **6M**

UNIT-IV

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

   b) Solve $(x^2-yz)p+(y^2-xz)q=(z^2-yx)$ **6M**

(OR)

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

   b) Solve $p(1+q)=qz$ **6M**

UNIT-V

9. Solve $\dfrac{\partial^2 z}{\partial x^2}+\dfrac{\partial^2 z}{\partial x\partial y}-6\dfrac{\partial^2 z}{\partial y^2}=y\cos x$ **12M**

(OR)

10. Solve $\dfrac{\partial^3 z}{\partial x^3}-2\dfrac{\partial^3 z}{\partial x^2\partial y}=2e^{2x}+3x^2y$. **12M**

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CODE: 18BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-2022

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 $(D^2 - 4D + 3)y = 3e^x + 100$	7M
	b)	Solve $\left(x^2y - 2xy^2\right)$ dx-$\left(x^3 - 3x^2y\right)dy = 0$	5M

(OR)

2.		Solve $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by method of variation of parameters	12M

UNIT-II

3.		Given that f (x) = x for 0< x < 2π find the Fourier expression of f(x).	12M

(OR)

4.	a)	Find the Fourier series expansion of the periodic function of period 2π $f(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$	7M
	b)	Represent the following function by a Fourier sine series $f(x) = e^{ax}$ $for\ 0 < x < \pi$	5M

UNIT-III

5.	a)	Using Fourier cosine integral representation of an appropriate function, show that $\int_0^\infty \frac{\cos wx}{k^2 + w^2} dw = \frac{\pi e^{-kx}}{2k},\ x > 0,\ k > 0$	6M
	b)	Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$ $for\ 0 < x < \pi$	6M

(OR)

6.		Prove that Fourier transform of $f(x) = e^{\frac{-x^2}{2}}$ is self reciprocal	12M

UNIT-IV

7.		Obtain the Laplace transform of the following 1) $t^2 e^t \sin 4t$ 2) $e^{-4t} \frac{\sin 3t}{t}$ 3) $\int_0^\infty \frac{e^{-t} - e^{-4t}}{t} dt$	12M

(OR)

8.		Using Laplace transform technique solve the following initial value problem $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 5\sin x,\ where\ y(0) = y^1(0) = 0$	12M

UNIT-V

9.	a)	State and Prove initial and final value thermos of Z-transforms	7M
	b)	Find the z- transform of f(k) = sin αk, α ≥ 0	5M

(OR)

10.		Solve $Z^{-1}\left[\frac{z^3 - 20z}{(z-2)^3(z-4)}\right]$	12M

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CODE: 16BS1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-2022

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

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UNIT-I

1. Find a positive root of x^3-x-1=0 correct upto two decimal places by using Bisection method. 14M

(OR)

2. a Determine the missing values in the following table 7M

x	0	5	10	15	20	25
y	6	10	-	17	-	31

b Determine the polynomial using Newton's forward difference formula, from the following data 7M

x	0	1	2	3
$f(x)$	1	2	1	10

UNIT-II

3. a Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ by using Trapezoidal rule 7M

b Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ by using Simpson's $\frac{1}{3}$ rule. 7M

(OR)

4. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = 1 + y^2$ with $y(0) = 0$ at $x = 0.2,\ 0.4$ 14M

UNIT-III

5. a Find the Laplace transform of $(\sin t - \cos t)^2$ 7M

b Find the Laplace transforms of the function $f(t) = \frac{e^{-at} - e^{-bt}}{t}$ 7M

(OR)

6. Using Laplace transform solve the differential equation $(D^2 + 2D - 3)y = \sin t, y(0) = y'(0) = 0$ 14M

UNIT-IV

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

b Obtain the half range sine series $f(x) = x^2$ in $(0,4)$ 7M

(OR)

8. Determine the Fourier series for $f(x) = x$ in $(0, 2\pi)$ 14 M

UNIT-V

9. Form a partial differential equation from $z = x\, f(ax + by) + g(ax + by)$, where *f* and *g* are arbitrary functions and *a* is a constant 14M

(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

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CODE: 13BS1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, February-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. Define rank of the matrix ? Find the rank of the matrix by reducing it to normal form 12M

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$$

(OR)

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

UNIT-II

4. Find the Eigen values of the matrix $A = \begin{bmatrix} 3 & -2 & -5 \\ 4 & -1 & -5 \\ -2 & -1 & -3 \end{bmatrix}$ 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 $0 < x < 2\pi$. 12M

(OR)

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

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

UNIT-IV

8. Solve $Z^{-1}\left[\frac{z^3-20z}{(z-2)^3(z-4)}\right]$ 12M

(OR)

9. Solve the difference equation, using Z-transform: 12M

$u_{n+2} - 3u_{n+1} + 2u_n = 0$, $u_0 = 0$, $u_1 = 1$

UNIT-V

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

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