AR18

CODE: 18BST102 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, October-2021

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) $\frac{dy}{dx} + (y-1)\cos x = e^{-\sin x}\cos^2 x$ 6M

   b) $(D^3 - 3D - 2)y = x^2$ 6M

(OR)

2. $(D^2 + 9)y = (x^2 + 1)e^{3x}$ 12M

UNIT-II

3. Obtain Fourier cosine series expansion of $f(x) = x\,\sin x, (0, \pi)$ and show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \cdots = \frac{\pi - 2}{4}$ 12M

(OR)

4. a) Find the Fourier series expansion of 6M

$$f(x) = \begin{cases} -\frac{1}{2}(\pi + x), for -\pi \le x \le 0 \\ \frac{1}{2}(\pi - x), for 0 \le x \le \pi \end{cases}$$

   b) Find the Half range Fourier sine series expansion of e^x in $0 < x < 1$ 6M

UNIT-III

5. Using Fourier integral Show that

$$e^{-x}\cos x = \frac{2}{\pi}\int_0^\infty \frac{\lambda^2+2}{\lambda^4+4}\cos\lambda x \, d\lambda$$ 12M

(OR)

6. a) Find the Fourier Cosine transform of e^{-ax}, $a > 0$ 6M

b) Find the Finite Fourier sine transform of $f(x) = x, 0 < x < 4$ 6M

UNIT-IV

7. Using Laplace transform solve the following Initial value problem $y'' + 7y' + 10y = 4e^{-3t}; y(0) = 0, y'(0) = -1$ 12M

(OR)

8. a) Find $L\left\{\int_0^t te^{-t}\sin 4t \, dt\right\}$ 6M

b) Find $L^{-1}\left\{\tan^{-1}\left(\frac{a}{s}\right) + \cot^{-1}\left(\frac{s}{b}\right)\right\}$ 6M

UNIT-V

9. If $Z[u_n] = \frac{z}{z-1} + \frac{z}{z^2+1}$ then find $Z[u_{n+2}]$ 12M

(OR)

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

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AR18

CODE: 18BST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, October-2021

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 the differential equation $\frac{dy}{dx} + yx = y^2 e^{\frac{x^2}{2}} Sin\, x$. 6M

   b) Bacteria in a culture grows exponentially so that the initial count has doubled in three hours. How many times the initial count will be present after nine hours? 6M

(OR)

2. a) Solve the differential equation $y(1+xy)dx + x(1-xy)dy = 0$. 6M

   b) Find the Orthogonal trajectories of the family of circles $x^2 + y^2 + 2gx + c - 0$, where g is the parameter. 6M

UNIT-II

3. a) Solve the differential equation $(D^2 - 5D + 6)y = e^x \text{ Sin } x$. 6M

   b) Solve the differential equation $(D^3 + 2D^2 - D - 2)y = 1 - 4x^3$ 6M

(OR)

4. Solve the differential equation $(D^2 - 4D + 4)y = 8x^2 + e^{2x}$ 12M

UNIT-III

5 Show that $\int_{-1}^{1} xP_n(x)P_{n-1}(x)\,dx = \frac{2n}{4n^2-1}$ 12M

(OR)

6. a) With an usual notation, Show that $J_{-n}(x) = (-1)^n J_n(x)$ 6M

   b) With an usual notation express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$ 6M

UNIT-IV

7. a) Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$ 6M

b) Solve $z^2 = 1 + p^2 + q^2$, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$ 6M

(OR)

8. a) Form the Partial differential equation by eliminating the arbitrary function from $f(x^2 + y^2, z - xy) = 0$. 6M

b) Solve $x^2p^2 + y^2q^2 = z^2$, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$ 6M

UNIT-V

9. a) Solve $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 2\mathrm{Sin}(3x + 2y)$ 6M

b) Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$. 6M

(OR)

10. a) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = Sinx\ Cos2y$ 6M

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

AR16

CODE: 16BS1002 **SET-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, October-2021

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 fourth root of 32 correct to 4 decimal places by Regula Falsi method — 7M

   b Estimate a real root of the equation $x^3 - 5x + 3 = 0$ by Newton Raphson method — 7M

(OR)

2. Compute $f(10)$ such that $f(1) = 168, f(7) = 192, f(15) = 336$ using Lagrange's interpolation formula — 14M

UNIT-II

3. a Determine $f'(50)$ using Newton's forward difference formula, from the following data — 7M

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

   b Given that — 7M

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
$\log x$	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6484

   evaluate $\int_4^{5.2} \log x dx$ by using Simpson's $\frac{3}{8}$ rule

(OR)

4. Using Taylor's method, solve $\frac{dy}{dx} = 2y + 3e^x$ with $y(0) = 0$ at $x = 0.2$ — 14M

UNIT-III

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

   b Evaluate $\int_0^\infty t\,e^{-2t}\sin 3t\,dt$ by Laplace transforms — 7M

(OR)

6. Using convolution theorem, evaluate $L^{-1}\left[\frac{1}{s^2(s^2+1)}\right]$ — 14M

UNIT-IV

7. Obtain the Fourier series for $f(x)=\begin{cases}-\pi & for\ -\pi<x<0\\ x & for\ 0<x<\pi\end{cases}$ in $(-\pi,\pi)$ — 14 M

(OR)

8. a Obtain the half range sine series $f(x)=x$ in $(0,2)$ — 7M

   b Obtain the half range cosine series $f(x)=(x-1)^2$ in $(0,1)$ — 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 $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ and $u=e^{-5y}$ when $x=0$ for all values of y — 7M

(OR)

10. Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x,0)=3\sin\pi x,\ u(0,t)=u(1,t)=0$ where $0<x<1,\ t>0$ — 14 M

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AR13

CODE: 13BS1003 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, October-2021

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) Find the value of k such that the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & k & 7 \\ 3 & 6 & 10 \end{bmatrix}$ is 2
   b) Write the consistency conditions
   c) Define Eigen values and eigen vectors
   d) Define diagonalization of a square matrix
   e) Write Dirichilets conditions for the fourier series
   f) Write the Sine and Cosine itegrals
   g) Write the value of $Z(a^n)$
   h) State the linear property of Z-transform
   i) Write the relation between Beta and Gamma functions
   j) If n is positive integer , then write the value of $\Gamma(n+1)$

PART-B

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

UNIT-I

2. a) Solve the system of equations $x + 2y + 3z = 1$, $2x + 3y + 8z = 2$, $x + y + z = 3$. Using gauss elimination method. 6M
   b) Using Normal form to find the rank of the following matrix 6M
   $\begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$

(OR)

3. Show that the only real number 'λ' for which the system $x + 2y + 3z = \lambda x$, $3x + y + 2z = \lambda y$, $2x + 3y + z = \lambda z$ has non- zero solution is 6, and solve them when $\lambda = 6$. 12M

UNIT-II

4. Find the eigen values and corresponding eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. 12M

(OR)

5. Diagonalize the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. 12M

UNIT-III

6. a) Find the half-range sine series of f(x) = 1 in [0,L] 6M

   b) Obtain the half-range Sine series for f(x) = e^x in (0,1) 6M

(OR)

7. Using Fourier integral formula, show that , 12M

$e^{-ax} - e^{-bx} = \frac{2(b^2-a^2)}{\pi}\int_0^\infty \frac{\lambda \sin\lambda x \, d\lambda}{(\lambda^2+a^2)(\lambda^2+b^2)}$ a, b >0

UNIT-IV

8. a) Find the Z- transform of $(1/2)^n + (1/3)^n$ 6M

   b) Using Convolution theorem to evaluate $Z^{-1}\left\{\left(\frac{z}{z-a}\right)^3\right\}$ 6M

(OR)

9. Evaluate $Z^{-1}\left\{\frac{z}{z^2+11z+24}\right\}$ 12M

UNIT-V

10. Show that $\int_0^{\pi/2} \sin^m\theta \cos^n\theta d\theta = (1/2)B(\frac{m+1}{2}, \frac{n+1}{2})$ 12M

(OR)

11. a) Show that $\int_{-1}^{1} (1+x)^{m-1}(1-x)^{n-1} = 2^{m+n-1}B(m,n)$ 6M

    b) Show that $\Gamma(1/2) = \sqrt{\pi}$ 6M

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