CODE: 16BS1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, Oct./Nov,2020

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 real root of $x^3 - 2x - 5 = 0$ correct to 3 decimal places by Regula Falsi Method **7M**

   b Compute a real root of the equation $x^4 - x - 10 = 0$ by Newton Raphson method **7M**

(OR)

2. a Compute y(17)using Newton's backward difference formula, from the following data **7M**

x	8	10	12	14	16	18
y	10	19	32.5	54	89.5	15.4

   b Find the polynomial such that $f(1) = 9, f(4) = 18, f(12) = 130$ using Lagrange's interpolation formula. **7M**

UNIT-II

3. a Using Taylor's method, solve $\frac{dy}{dx} = 2y + 3e^x$ with $y(0) = 0$ at $x = 0.2$ **7M**

   b Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}$ with y(1)=0 at x=1.2 **7M**

(OR)

4. a Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule **7M**

   b Determine $f'(50)$ using Newton's forward difference formula, fro the following data **7M**

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

UNIT-III

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

   b Find $L^{-1}\left\{\frac{3s+2}{s^2-s-2}\right\}$ **7M**

(OR)

6. a Find the Laplace transform of the full wave rectifier function defined by **7M**

   $f(t) = E\ \sin\omega t\ if\ \ 0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$

   b Solve $\frac{d^4y}{dt^4} - k^4y = 0,$ where $y(0) = 1, y'(0) = y''(0) = y'''(0) = 0$ by using Laplace transform method. **7M**

UNIT-IV

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

   b Obtain the half range cosine series $f(x) = (x-1)^2$ in $(0,1)$ **7M**

(OR)

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

   b Obtain the half range sine series $f(x) = x$ in $(0,2)$ **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 $y\frac{\partial u}{\partial x} + x\frac{\partial u}{\partial y} = 3u$ and $u(x,\,0) = e^{x^2}$ by the method of separation of variables **7M**

(OR)

10. a Find a partial differential equation from $z = f(x+at) + g(x-at)$ **7M**

    b The ends A and B of a rod of 20 cm long, have the temperature at $30^\circ C$ and $80^\circ C$ until steady state prevails. The temperature of the ends are changed to $40^\circ C$ and $60^\circ C$ respectively. Find the temperature distribution in the rod at time t **7M**

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AR13

CODE: 13BS1003 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

I B.TECH II SEM SUPPLEMENTARY EXAMINATIONS, OCT./NOV,2020

ENGINEERING MATHEMATICS -III
(Common to CE, ME, CSE, IT, ECE & EEE)

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

<u>PART-A</u>

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

1. a) If $A=\begin{bmatrix} 1-i & i+2 & -i \\ 3 & 5 & i+6 \end{bmatrix}$, then $\overline{A}=--$

   b) The eigen values of $A=\begin{bmatrix} i/2 & \sqrt{3}/2 \\ \sqrt{3}/2 & i/2 \end{bmatrix}$

   c) If $\lambda^2-5\lambda-2=0$ is the characteristic equation of A then $A^{-1}=$.....

   d) The matrix of the quadratic form $x^2+y^2+z^2$ is

   e) What are the conditions required to express a function $f(x)$ as a Fourier series

   f) Write Fourier sine integral formulas for f(x)

   g) Find the Z-Transform of na^n

   h) Write the initial value theorem of Z-Transform

   i) Using Gamma function find the value of $\int_0^\infty e^{-x^2}dx$

   j) Find the value of $\beta\left(\frac{1}{4},\frac{3}{4}\right)$

<u>PART-B</u>

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

<u>UNIT-I</u>

2. a) **Reduce the matrix** $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ **to Echelon form and find its rank** **6M**

   b) **Find the values of a and b for which the equations $x+y+z=3$, $x+2y+2z=6$, $x+ay+3z=b$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions.** **6M**

(OR)

3. a) **Find what value of k the matrix** $\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ k & 2 & 2 & 2 \\ 9 & 9 & k & 3 \end{bmatrix}$ **has rank 3.** **6M**

   b) **Solve completely the following system of equations** **6M**
   $x+y-3z+2w=0,\ 2x-y+2z-3w=0,\ 3x-2y+z-4w=0,\ -4x+y-3z+w=0$

UNIT-II

4. a) **Find the Eigen values and Eigen vectors of the matrix** $\begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$ **8M**

b) Write down the quadratic form corresponding to the matrix $\begin{bmatrix} 0 & 5 & -1 \\ 5 & 1 & 6 \\ -1 & 6 & 2 \end{bmatrix}$ **4M**

(OR)

5. a) **Find the Eigen values and Eigen vectors of the matrix** $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ **8M**

b) **Represent the quadratic form** $x^2+4y^2+z^2-4xy+2xz-4yz$ **in matrix notation.** **4M**

UNIT-III

6. a) **Find a Fourier series to represent** $x-x^2$ **in the interval** $(-\pi,\pi)$ **6M**

b) Find the Fourier transform of $f(x)=\begin{cases} 1-x^2, \; if \; |x|\le 1 \\ 0, \; if \; |x|>1 \end{cases}$**. Hence evaluate** **6M**

$\int_0^\infty \frac{x\cos x-\sin x}{x^3}\cos\frac{x}{2}\,dx$

(OR)

7. a) **Expand** $f(x)=\begin{cases} \frac{1}{4}-x, \; if \; 0<x<\frac{1}{2} \\ x-\frac{3}{4}, \; if \; \frac{1}{2}<x<1 \end{cases}$ **as the Fourier series of sine terms.** **6M**

b) **Find the Fourier cosine transform of** e^{-x^2} **6M**

UNIT-IV

8. a) **If** $\bar{u}(z)=\frac{2z^2+5z+14}{(z-1)^4}$, **evaluate** u_2 **and** u_3 **6M**

b) Find the inverse Z-Transform of (i) $\frac{2z^2+3z}{(z+2)(z-4)}$ **(ii)** $\frac{2z^3-20z}{(z-2)^3(z-4)}$ **6M**

(OR)

9. a) **Show that** $Z[\frac{1}{n!}]=e^{1/z}$**. Hence evaluate** $Z[\frac{1}{(n+1)!}]$ **and** $Z[\frac{1}{(n+2)!}]$ **6M**

b) **Solve the difference equation** $u_{n+2}-2u_{n+1}+u_n=3n+5$ **6M**

UNIT-V

10. a) **Prove that** $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ **6M**

b) Prove that $\beta(n,n+1)=\frac{1}{2}\frac{[\Gamma(n)]^2}{\Gamma(2n)}$ hence find the value of $\beta\left(\frac{1}{4},\frac{5}{4}\right)$ **6M**

(OR)

11. a) **Express the following integrals in terms of gamma functions** **6M**

(i) $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ **(ii)** $\int_0^{\pi/2} \sqrt{\tan\theta}\,d\theta$

b) **Show that (i)** $\Gamma(n)=\int_0^1 \left\{\log\left(\frac{1}{x}\right)\right\}^{n-1}dx$ **(ii)** $\beta(m,n+1)+\beta(m+1,n)=\beta(m,n)$ **6M**