Code No: 09A1BS04 **R09** **Set No. 2**

I B.Tech Examinations,December 2010
MATHEMATICAL METHODS
Common to BME, IT, ICE, E.COMP.E, ETM, EIE, CSE, ECE, EEE
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Verify Cayley Hamilton theorem and find the inverse of $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. [15]

2. (a) Find a real root of the equation, x Sinx + Cos x = 0 using regula falsi method.
   (b) Find y(32) if y(10)=35.3, y(15) = 32., y (20) = 29.2 y (25) = 26.1 y (30) = 23.2, y(35) = 20.5 using Newton's forward interpolation formula. [8+7]

3. (a) Compute the first and second derivatives at x=2.03 of the following table:

x	1.96	1.98	2.00	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

   (b) From the following table of values of x and y find $\frac{dy}{dx}$ at x=0.5

x	0.35	0.40	0.45	0.5	0.55	0.6	0.65
y	1.521	1.506	1.488	1.467	1.444	1.418	1.389

[8+7]

4. (a) Find the maximum and minimum values of f = $3x^2$ +$5y^2$+$3z^2$-2xy+ 2zx - 2yz subject to x + y + z = 1. Also find the point at which the maximum and minimum exists.
   (b) Find the nature of the quadratic form $10x^2$ +$2y^2$ +$5z^2$- 4xy- 10zx + 6yz.[8+7]

5. Find y(0.5), y(1) and y(1.5) given that $\frac{dy}{dx}$=4-2x and y(0)=2 with h=0.5 using modified Euler's method. [15]

6. If f(x) $\begin{matrix} = x \ \ for \ \ 0 < x < \Pi/2 \\ = \Pi - x \ \ for \ \ \Pi/2 < x < \Pi \end{matrix}$. then prove that
   (a) f(x)=$\frac{4}{\Pi}[\sin x - \frac{1}{3^2}\sin 3x + \frac{1}{5^2}\sin 5x - --]$.
   (b) f(x)=$\frac{\Pi}{4} - \frac{2}{\Pi}[\frac{1}{1^2}\cos 2x + \frac{1}{3^2}\cos 6x + \frac{1}{5^2}\cos 10x + --]$. [8+7]

7. (a) Solve $\frac{p}{x^2} + \frac{q}{y^2} = 1$.
   (b) Solve $p^2 + q^2 = z^2(x^2 + y^2)$. [7+8]

8. (a) Find the Rank of the Matrix ,by reducing it to the normal form. $\begin{bmatrix} 2 & 1 & -3 & -6 \\ 2 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$

(b) Find whether the following system of equations are consistent. If so solve them.5x + 3y +7z = 0, 3x + 26y +2z = 9, 7x + 2y +10 z = 5. [7+8]

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Time: 3 hours **Max Marks: 75**

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1. Find the eigen values and the corresponding eigen vectors of $\begin{bmatrix} 1 & 3 & 7 \\ 1 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$. [15]

2. Reduce the quadratic form to the canonical $3x^2$-$2y^2$-z^2- 4xy + 8xz+12yz. [15]

3. (a) Solve $(x^3 + 3xy^2)p + (y^3 + 3x^2y)$q=$2(x^2 + y^2)$z.
   (b) Solve x$(y^2 - z^2)p - y(z^2 + x^2)$q=z$(x^2+y^2)$. [7+8]

4. (a) Find the Rank of the Matrix ,by reducing it to the normal form. $\begin{bmatrix} 1 & -1 & 2 & 5 \\ 2 & 1 & 4 & 3 \\ 1 & -1 & -3 & 5 \end{bmatrix}$.
   (b) Solve the following tridiagonal system 3x - y = 5, x + 2y - 2z = 6, 4y + 3z = 1. [8+7]

5. Evaluate $\int_0^1 \frac{1}{1+x}dx$
   (a) By Trapezoidal rule and Simpson's $\frac{1}{3}$ rule.
   (b) Using Simpson's $\frac{3}{8}$ rule. [8+7]

6. If $f(x) = \begin{cases} 1 \ \ in \ \ 0 < x < \Pi/2 \\ -1 \ \ in \ \ \Pi/2 < x < \Pi \end{cases}$ Expand f(x) in a series of cosines. [15]

7. Find y(.1) and y(.2) using Runge-Kutta fourth order formula given that $\frac{dy}{dx}$=x^2-y and y(0)=1. [15]

8. (a) Find a real root of the equation xe^x= cos x by Newton Raphson method.
   (b) The amount A of a substance remaining in a reaction system after an interval of time t in a certain chemical experiment is given by the following data.

t	2	5	8	14
A	94.8	87.9	813	68.7

Find value of A at t = 11. [8+7]

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Code No: 09A1BS04 **R09** **Set No. 1**

I B.Tech Examinations,December 2010
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
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1. Form the partial differential equations
   (a) z=f(x-it)+g(x-it)
   (b) z=y^2+2f$\left(\frac{1}{x}+\log y\right)$.
   (c) F(xy+z^2, x+y+z)=0. [5+5+5]
2. (a) Find a real root of the equation e^x sin x=1using Newton Raphson method
   (b) Find y(10), Given that y(5) = 12 , y(6) = 13, y(9)=14, y(11) = 16 using Lagrange's formula. [8+7]
3. (a) Find the maximum and minimum values of f = $2x^2$ + $2y^2$ +$2z^2$-2xy +2zx - 2yz subject to x + y + z = 1. Also find the point at which the maximum and minimum exists.
   (b) Find the nature of the quadratic form $3x^2$ +$2y^2$ +$3z^2$- 2xy - 2yz. [8+7]
4. Verify Cayley Hamilton theorem and find the inverse of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. [15]
5. (a) Find the Rank of the Matrix ,by reducing it to the normal form. $\begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$
   (b) Solve the following equations by expressing the coefficient matrix as a product of a lower triangular and upper triangular matrices. x + y - z = 5, 2x + y + 2z = 5, 3x + 2y - 4z = 7. [7+8]
6. Given $y^{|} = x+siny$ and y(0)=1 compute y(0.2) and y(0.4) with h=0.2 using Euler's modified method. [15]
7. (a) Find the half-range sine series of f(x)=1 in [0, l].
   (b) Find the half-range cosine and sine series for f(x)=x in (0, l). [7+8]
8. Evaluate $\int_0^6 \frac{1}{(1+x)}$ dx by using
   (a) Simpson's $\frac{1}{3}$ Rule.

(b) Trapezoidal Rule.

(c) Simpson's $\frac{3}{8}$ Rule. [5+5+5]

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Code No: 09A1BS04 **R09** **Set No. 3**

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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
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1. (a) Find the Rank of the Matrix ,by reducing it to the normal form.
$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -3 \\ 3 & -1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$
(b) Solve the following tridiagonal system
2x - y = 3, x + 4y + 3z = 3, 2y + 4z = 6. [8+7]

2. (a) Express f(x)=$\frac{\Pi^2}{12} - \frac{x^2}{4}$ as a Fourier in $-\Pi < x < \Pi$.
(b) Find the Fourier Series to represent the function f(x)=sinx in $-\Pi < x < \Pi$. [8+7]

3. (a) Find the constants a and b by the method of least squares such that $y = ae^{bx}$

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

.
(b) Find thecurve of best fit of the type $y = ae^{bx}$to the followiong data by method of least squares.

x	1	5	7	9	12
y	10	15	12	15	21

. [8+7]

4. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ and y(0)=1. Compute y(0.1) in steps of 0.02 using Euler's modified method. [15]

5. Reduce the quadratic form to the canonical form $2x^2$ + $2y^2$ +$2z^2$ - 2xy + 2zx - 2yz. [15]

6. (a) Solve 2(z+px+qy)=p^2y.
(b) Solve $(p^2 + q^2)$y=qz. [8+7]

7. Diagonalize the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$. [15]

8. (a) Find a real root of the equation , x^3- 9x + 1 = 0 using regula falsi method.
(b) Prove that $\left(E^{1/2} + E^{-1/2}\right)(1 + \Delta)^{1/2} = 2 + \Delta$. [8+7]

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