Code No: R201109 **R20** SET - 1

I B. Tech I Semester Regular Examinations, April - 2022

MATHEMATICS-II

(Only EEE)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

UNIT-I

1. a) Find the rank of $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & -4 \\ 2 & 3 & 5 & -5 \\ 3 & -4 & -5 & 8 \end{bmatrix}$ by Echelon form (5M)

   b) Find the Eigen values and Eigen vectors of $A = \begin{bmatrix} 3 & -6 & 3 \\ 1 & 0 & -1 \\ 1 & 2 & -3 \end{bmatrix}$. (9M)

Or

2. a) Solve the system of equations by Gauss -elimination method (8M)
   $2x + y + 2z + w = 6$, $6x - 6y + 6z + 12w = 36$, $4x + 3y + 3z - 3w = -1$, $2x + 2y - z + w = 10$.

   b) Prove that the eigen vectors corresponding to distinct eigenvalues of a matrix are independent. (6M)

UNIT-II

3. a) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 4 & 1 & 1 \\ 1 & 4 & 1 \\ 1 & 1 & 4 \end{bmatrix}$ and hence find A^{-1}. (7M)

   b) Find Singular values and singular value decomposition of a matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$. (7M)

Or

4. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to the canonical form by orthogonal transformations and find rank, index, signature, nature of the quadratic form. (14M)

UNIT-III

5. a) Find a real root of $xe^x = 3$ using Regula–Falsi method. (5M)

   b) Perform two iterations of the Newton-Raphson method to solve the system of equations $x^2 + y^2 + xy = 7$ and $x^3 + y^3 = 9$. (9M)

Or

6. a) Using Newton Raphson method, find real root of $\cos x = xe^x$ and correct to four decimal places. (7M)

   b) Solve the system *10x-2y-z-w=3; -2x+10y-z-w=15; -x-y+10z-2w=15; -x-y-2z+10w= -9* using Gauss Seidel method. (7M)

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UNIT-IV

7. a) The population of a nation in the decimal census was given below. Estimate the population in the year 1925 using appropriate interpolation formula (7M)

Year x	1891	1901	1911	1921	1931
Population y (thousands)	46	66	81	93	101

b) Find Interpolating polynomial by Lagrange's method and hence find f(2) for the following data (7M)

x	0	1	3	4
f(x)	-12	0	6	12

Or

8. a) Evaluate i). $\Delta^2 \sin(px+q)$ ii) $\Delta\left[\frac{f(x)}{g(x)}\right]$. (6M)

b) Using Newton's divided difference formula, evaluate *f(8)* given (8M)

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

UNIT-V

9. a) Find y(1.1) by Taylor's series method given that $y' = y + x$, y(1) = 0. (7M)

b) Compute the value of $\int_{0.2}^{1.4} (\log x + e^x)dx$ using Simpson's 3/8th rule. (7M)

Or

10. a) Using Euler method find y(0.2) y(0.4) and y(0.6) given $y' = y + e^x$, y(0) = 0. (7M)

b) Find $y(0.1)$ using Runge-Kutta fourth order formula given that (7M)
$y^1 = x + x^2 y; y(0) = 1.$

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I B. Tech I Semester Regular Examinations, April - 2022

MATHEMATICS-II

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Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
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UNIT-I

1 a) Find rank of matrix $A=\begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \\ 2 & 4 & 0 & 3 \end{bmatrix}$ using Echelon form (5M)

b) Find the Eigen values and Eigen vectors of A=$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (9M)

Or

2 a) Solve the system of equations by Gauss -elimination method (8M)
$x + y + z - w = 2$, $7x + y + 3z + w = 12$, $8x - y + z - 3w = 5$,
$10x + 5y - 3z + 2w = 20$.

b) Prove that the eigen vectors corresponding to distinct eigenvalues of a real symmetric matrix are orthogonal. (6M)

UNIT-II

3 a) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 6 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ and hence find A^{-1}. (7M)

b) Find Singular values and singular value decomposition of a matrix $\begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{bmatrix}$. (7M)

Or

4 Reduce the quadratic form $3x^2 + 2y^2 + 3z^2 - 2xy - 2yz$ to the canonical form by orthogonal transformations and find rank, index, signature, nature of the quadratic form. (14M)

UNIT-III

5 a) Find a real root for $e^x \sin x = 1$, using Regula Falsi method. (5M)

b) Perform two iterations of the Newton-Raphson method to solve the system of equations $x^2 + 3y^2 = 4$ and $x^2 + 3x + y = 5$. (9M)

Or

6 a) Using Newton-Raphson method find the root of the equation $x + \log_{10} x = 3.375$ corrected to four significant figures. (7M)

b) Solve the system of equations *x+y+54z=110; 27x +6y –z =85; 6x+15y +2z =72* using Gauss Seidel method. (7M)

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UNIT-IV

7 a) From the following table of half yearly premium for policies, estimate the premium for policies at the age of 63. (7M)

Age x	45	50	55	60	65
Premium y	114.84	96.16	83.32	74.48	68.48

b) Using Lagrange's Interpolation formula find the value of y(10) from the following table (7M)

x	5	6	9	11
y(x)	12	13	14	16

Or

8 a) Prove that $\Delta \tan^{-1}\left(\frac{n-1}{n}\right) = \tan^{-1}\left(\frac{1}{2n^2}\right)$. (6M)

b) Given the values, find *f(9)*, using divided difference formula (8M)

x	5	7	11	13	18
f(x)	150	392	1452	2366	5202

UNIT-V

9 a) Evaluate y(1.1) from $y' = y - x^2$, $y(0) = 1$, by using Taylor series method. (7M)

b) Find the value of y at x = 0.1 by Picard's method, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0) = 1. (7M)

Or

10 a) Apply the fourth order Runge-Kutta method, to find an approximate value of y when x = 1.2, given that : $y' = x^2 + y^2$, y(1) = 1.5. (7M)

b) Evaluate $\int_0^1 \sqrt{1+x^4}\,dx$ using Simpson's 3/8 rule. (7M)

Code No: R201109 **R20** SET - 3

I B. Tech I Semester Regular Examinations, April - 2022

MATHEMATICS-II

(Only EEE)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
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UNIT-I

1 a) Find rank of matrix $A=\begin{bmatrix}1&2&3&0\\2&4&3&2\\3&2&1&3\\6&8&7&5\end{bmatrix}$ by reducing it to Echelon form. (5M)

b) Find the Eigen values and Eigen vectors of A=. $\begin{bmatrix}1&0&3\\1&2&1\\2&2&3\end{bmatrix}$ (9M)

Or

2 a) Solve the system of equations by Gauss -elimination method (8M)
$5x+y+z+w=4$, $x+7y+z+w=12$, $x+y+6z+w=-5$, $x+y+z+4w=-6$.

b) Prove that the eigenvalues of a real symmetric matrix are real. (6M)

UNIT-II

3 a) Verify Cayley Hamilton theorem for the Matrix $A=\begin{bmatrix}1&1&2\\1&2&1\\2&1&1\end{bmatrix}$ and hence find A^{-1}. (7M)

b) Find Singular values and singular value decomposition of a matrix $\begin{bmatrix}3&1&1\\-1&3&1\end{bmatrix}$. (7M)

Or

4 Reduce the quadratic form $6x^2+3y^2+3z^2-4xy-2yz+4zx$ to the canonical form by orthogonal transformations and find rank, index, signature, nature of the quadratic form. (14M)

UNIT-III

5 a) Using Regula-falsi method, find the real root of $2x-\log x=6$ correct to three decimal places. (5M)

b) Solve *sinx –y+1.32=0 and x-cosy -0.85 =0* starting with $x_0=0.6$ and $y_0=1.9$ using Newton Raphson method. (9M)

Or

6 a) Find a real root of $x^4-x-9=0$ using Newton-Raphson method. (7M)

b) Solve the system *10x-2y-z-w=3; -2x+10y-z-w=15; -x-y+10z-2w=15; -x-y-2z+10w= -9* using Gauss Seidel method. (7M)

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UNIT-IV

7 a) Find f(2.5) using Newton's forward formula from the following table: (7M)

x	0	1	2	3	4	5	6
y	0	1	16	81	256	625	1296

b) Using Lagrange's interpolating formula, find y (10) from the following table (7M)

x	5	6	9	11
f(x)	12	13	14	16

Or

8 a) Prove that i) $\Delta\nabla = \Delta - \nabla$ ii) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$. (7M)

b) Using Newton's divided difference formula, find y (8) from the following table (7M)

x	5	6	9	10
f(x)	12	13	14	16

UNIT-V

9 a) Solve $y' = y - x^2$, y(0) = 1, by Picard's method up to the fourth approximation. Hence, find the value of y(0.1). (7M)

b) Evaluate $\int_0^2 e^{-x^2} dx$ using Simpson's rule taking h = 0.25. (7M)

Or

10 a) Given $y^1 = x + \sin y$, $y(0) = 1$, compute $y(0.2)$ using Euler's method taking h=0.05 (7M)

b) Using Runge-kutta method of fourth order, find y (0.3), given that (7M)
$\frac{dy}{dx} = \frac{1}{2}(1+x)y^2$, y(0) = 1.

Code No: R201109 **R20** SET - 4

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MATHEMATICS-II

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Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

UNIT-I

1 a) Find rank of matrix $A=\begin{bmatrix}2&3&4&5\\3&4&5&6\\4&5&6&7\\5&6&7&8\end{bmatrix}$ using Echelon form (5M)

b) Find the eigenvalues and the corresponding eigen vectors of $\begin{bmatrix}6&-2&2\\-2&3&-1\\2&-1&3\end{bmatrix}$ (9M)

Or

2 a) Solve the system of equations by Gauss -elimination method (8M)

$2x-y+2z+6w=4$, $6x+y+6z+12w=2$, $4x+y+3z-3w=-1$, $2x+2y-z+w=1$.

b) Prove that the eigen vectors corresponding to distinct eigenvalues of a matrix are independent. (6M)

UNIT-II

3 a) Verify Cayley Hamilton theorem for the Matrix A= $\begin{bmatrix}1&-3&1\\6&3&1\\1&3&1\end{bmatrix}$ and hence find A^{-1}. (7M)

b) Find Singular values and singular value decomposition of a matrix $\begin{bmatrix}3&0\\4&5\end{bmatrix}$. (7M)

Or

4 Reduce the quadratic form $3x^2+3y^2+3z^2+2xy-2yz+2zx$ to the canonical form by orthogonal transformations and find rank, index, signature, nature of the quadratic form. (14M)

UNIT-III

5 a) Using Regular Falsi method, find real root of $x^3-2x-5=0.$ (5M)

b) Solve the system of equations by Newton Raphson method $x^2+y^2-1=0$ and $y-x^2=0.$ (9M)

Or

6 a) Using Newton-Raphson method find the root of the equation $x+\log_{10}x=3.375$ corrected to four significant figures. (7M)

b) Solve the system *10x-2y-z-w=3; -2x+10y-z-w=15; -x-y+10z-2w=15; -x-y-2z+10w= -9* using Gauss Seidel method. (7M)

UNIT-IV

7 a) Construct difference table for the following data (7M)

x	0.1	0.3	0.5	0.7	0.9	1.1	1.3
f(x)	0.003	0.067	0.148	0.248	0.370	0.518	0.697

and evaluate f (0.6).

b) Using Lagrange's interpolating formula, find y (8) from the following table (7M)

x	1	4	6	10
f(x)	3	5	9	11

Or

8 a) Find the second difference of the polynomial $x^4 - 12x^3 + 42x^2 - 30x + 9$ with interval of differencing h = 2. (7M)

b) Using Newton's divided difference formula, find y (8) from the following table (7M)

x	3	5	9	11
f(x)	10	13	12	18

UNIT-V

9 a) Evaluate $\int_0^2 e^{-x^2} dx$ using Trapezoidal rule taking h = 0.25. (7M)

b) Given $y' = x + \sin y$, y(0) = 1, compute y(0.2) using Euler's method taking h=0.05 (7M)

Or

10 a) Find y(0.1) using Runge-Kutta fourth order formula given that $y^1 = x + x^2 y; y(0) = 1.$ (7M)

b) Solve $y' = y - x^2$, y(0) = 1, by Taylor's method up to the fourth approximation. Hence, find the value of y(0.1). (7M)