Code: 9ABS105

R09

B.Tech I Year (R09) Supplementary Examinations June 2017

MATHEMATICAL METHODS

(Common to CSE, ECE, EEE, EIE, ECM, E.Con.E, IT & CSS)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 Determine A^{-1}, A^{-2}, A^{-3} if A= $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$ using Cayley Hamilton theorem.

2 Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz + 2zx$ to canonical form by orthogonal transformation and hence find the rank, index, signature and nature of the quadratic form.

3 (a) Find a real root of the equation cos x = 3x -1 correct to three decimal places

(b) Using Lagrange's interpolation formula find the value of y when x = 10, if the following values of x and y are given.

x:	5	6	9	11
y:	12	13	14	16

4 (a) Fit a curve $y = ax^b$ to the following data.

x:	1	2	3	4	5	6
y :	2.98	4.26	5.21	6.10	6.80	7.50

(b) Evaluate $\int_2^{10} \frac{dx}{1+x}$ using Simpson's $\frac{1}{3}$ rule, taking h = 1.0 and compare the results with exact value.

5 (a) Find by Taylor's series method the value of $y\ at\ x = 0.1$ to five places of decimals from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

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

6 (a) Obtain the Fourier series of $f(x) = 2x - x^2\ in\ 0 < x < 3$ and $f(x+3) = f(x)$.

(b) Find the Fourier sine and cosine transform of $f(x) = e^{-ax}, a > 0$.

7 Determine the solution of one-dimensional heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0,t) = 0, u(L,t) = 0, t > 0$ and the initial condition $u(x,0) = x$, L being the length of the bar.

8 (a) Prove that Z-transform is linear. Hence evaluate $Z\{(n+1)^2\}$ and $Z\{\sin(3n+5)\}$.

(b) Solve the differential equation $u_{n+2} - 2u_{n+1} + u_n = 2^n$, given that $u_0 = 2, u_1 = 1$. Using Z- transform.

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