Code: 9ABS105

R9

B.Tech I Year (R09) Supplementary Examinations, November/December 2012

MATHEMATICAL METHODS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Reduce the matrix to Echelon form and find its rank

$$\begin{pmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{pmatrix}$$

(b) Test for consistency and if consistent solve the system, $5x + 3y + 7t = 4$; $3x + 26y + 2t = 9$; $7x + 2y + 10t = 5$.

2 (a) Prove that the Eigen values of a Hermitian matrix are all real.

(b) Reduce the following quadratic form to canonical form by Lagrange's reduction: $x^2 - 14y^2 + 2z^2 + 4xy + 16yz + 2zx$ and hence find the index, signature and nature of the quadratic form.

3 (a) Find a real root of the equation $x = e^{-x}$, using the Newton-Raphson method.

(b) Consider the following data for $g(x) = (\sin x) / x^2$

x	0.1	0.2	0.3	0.4	0.5
g(x)	9.9833	4.9696	3.2836	2.4339	1.9177

Calculate g(0.25) accurately using Newton's forward method of interpolation

4 (a) Fit a second degree parabola to the data

x:	0	1	2	3	4
y :	1.0	1.8	1.3	2.5	6.3

(b) Evaluate $\int_0^{\pi/2} \sin x \, dx$ by Simpson's $\frac{1}{3}$ rule and compare with the exact value.

Contd. in Page 2

Code: 9ABS105

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5 (a) Using Euler's method, solve for y at $x = 0.1\ from\ \frac{dy}{dx} = x + y + xy,\ y(0) = 1\ \ taking\ step$ size $h = 0.025$.

(b) Using the Taylor's series method, solve $\frac{dy}{dx} = xy + y^2, y(0) = 1\ at\ x = 0.1$.

6 (a) Express $f(x) = x$ as a Fourier series in the interval $-\pi < x < \pi$.

(b) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$. Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\, dx$.

7 Solve completely the equation $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$, representing the vibrations of a string of Length l, fixed at both ends, given that $y(0,t) = 0, (l,t) = 0,\ y(x,0) = f(x)$ and $\frac{\partial y(x,0)}{\partial t} = g(x), 0 < x < l$.

8 (a) Find Z-transform of $\cos h\, n\theta\ \ and\ \ \sin h\, n\theta$.

(b) Find $Z^{-1}\left\{\frac{z^3 - 20z}{(z-2)^3(z-4)}\right\}$.

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