Code: R7100204

R07

B. Tech I Year (R07) Supplementary Examinations, May 2012

MATHEMATICAL METHODS

(Common to EEE, ECE, ME, CSE, EIE, IT, E.Con.E, ECC, CSS)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Show that every square matrix can be expressed as a sum of a symmetric and skew – symmetric matrices.

(b) Reduce the matrix $\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ to normal form and hence find the rank.

(c) If $a+b+c \neq 0$, show that the system of equations $-2x+y+z = a$, $x-2y+z = b$, $x+y-2z = c$ has no solution. If $a+b+c = 0$, show that it has infinitely many solutions.

2 (a) Prove that the two Eigen vectors corresponding to the two different Eigen values are linearly independent.

(b) Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & -2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ satisfies the characteristic equations. Hence find A^{-1}.

3 (a) Show that the Eigen values of a Hermitian matrix are real.

(b) Find nature of the quadratic form, index and signature of $10x^2 + 2y^2 + 5z^2 - 4xy - 10xz - 6yz$.

4 (a) Find out the square root of 25 given $x_0 = 2.0$, $x_1 = 7.0$ using bisection method.

(b) Given x = 1, 2, 3, 4 and f(x) = 1, 2, 9, 28 respectively. Find f (3.5) using Lagrange method of 2nd and 3rd order degree polynomial.

5 (a) Fit the curve of the form $y = a e^{bx}$

X	77	100	185	239	285
y	2.4	3.4	7.0	11.1	19.6

(b) In valuate $\int_0^1 \frac{1}{1+x} dx$.

(i) By trapezoidal rule. (ii) Simpson's 1/3 rule. (iii) Simpson's 3/8 rule taking.

6 (a) Tabulate y (0.1), y (0.2) and y (0.3) using Taylor's series method given that $Y' = y^2+x$ and y (0) =1.

(b) Find y (0.1) and y (0.2) using Runge–Kutta 4th order formula given that $Y' = x^2 - y$ and y (0) =1.

7 (a) Find the Fourier series of the periodic function defined as $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots = \frac{\pi^2}{8}$.

(b) Find the Fourier cosine transform of f(x) defined by $f(x) = \frac{1}{1+x^2}$ and hence find Fourier sine transform of $f(x) = \frac{x}{1+x^2}$.

8 (a) Form the partial differential equation by eliminating the arbitrary function from $z = y\, f(x^2+z^2)$.

(b) Solve by the method of separation of variables $4u_x+u_y = 3u$ given $u = 3e^{-y} - e^{-5y}$ when x =0.

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