

R09
Code: 9ABS105

B.Tech I Year (R09) Supplementary Examinations June 2016

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

- 1 Verify Cayley-Hamilton theorem for the matrix A and hence Compute A^{-1} and A^5 , given

$$A = \begin{bmatrix} 8 & -12 & 5 \\ 15 & -25 & 11 \\ 24 & -42 & 19 \end{bmatrix}$$

- 2 Find the orthogonal transformation which transforms the quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$ to canonical form and hence find the rank, index, signature and nature of the quadratic form.

- 3 (a) Find the root of the equation $\sin x = 10(x-1)$ by iteration method.
(b) Using Lagrange's formula find the form of $f(x)$ given:

x	0	2	3	6
$f(x)$	648	704	729	792

- 4 The table below shows the velocities of a car at various intervals of time. Find the distance covered by the car using Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ rule.

Time(min)	0	2	4	6	8	10	12
Velocity(km/hr)	0	22	30	27	18	7	0

- 5 Find $y(0.4)$ by Milne's method given $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$ with $h = 0.1$.

- 6 (a) Find a Fourier series for $f(x) = x + x^2$ in the interval $-\pi \leq x \leq \pi$.
(b) Find the Fourier sine and cosine transform of $f(x) = \begin{cases} k, & 0 < x < a \\ 0, & x > a \end{cases}$.

- 7 An insulated rod of length L has its ends A and B maintained at 0°C and 100°C respectively, until Steady state conditions prevail. If B is suddenly reduced to 0°C , find the temperature at a distance x from A at time t .

- 8 (a) Find $Z\{(\cos \theta - i \sin \theta)^n\}$. Hence evaluate $Z(\cos n\theta)$ and $Z(\sin n\theta)$.
(b) Use convolution theorem to evaluate $Z^{-1}\left\{\left(\frac{z}{z-a}\right)^3\right\}$. Deduce $Z^{-1}\left\{\left(\frac{z}{z-1}\right)^3\right\}$.
