

Code: CE2T2, CS2T1, EC2T1, EM2T2, EE2T1, IT2T3, ME2T1, AE2T1

I B.Tech-II Semester-Regular Examinations - July 2014

ENGINEERING MATHEMATICS - II
(Common for All Branches)

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Test for constancy and solve the following equations

$$4x+2y+z+3w=0$$

$$6x+3y+4z+7w=0$$

$$2x+y+w=0$$

7 M

b) Reduce the following matrix into its normal form and hence find its rank

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

7 M

2. a) Show that sum of all eigen values of a matrix is equal to the sum of the elements of the principal Diagonal. 7 M

b) Verify Cayley –Hamilton theorem for the matrix

$$A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} \text{ find its inverse. Also express}$$

$A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as a linear polynomial in A

7 M

3. a) Obtain the Fourier Series for the function

$$f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2 - x), & 1 \leq x \leq 2. \end{cases}$$

Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ 7 M

b) Obtain cosine and sine series for the $f(x) = x$ in the interval $0 \leq x \leq \pi$.

Hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ 7 M

4. a) Express $f(x) = \begin{cases} 1, & \text{for } 0 \leq x \leq \pi \\ 0 & \text{for } x \geq \pi \end{cases}$

As a sine integral and hence evaluate

$$\int_0^{\infty} \frac{1 - \cos \pi \lambda}{\lambda} \sin(x\lambda) d\lambda$$
 7 M

b) Solve the integral equation

$$\int_0^{\infty} f(\theta) \cos \alpha \theta d\theta = \begin{cases} 1 - \alpha, & \text{for } 0 \leq \alpha \leq 1 \\ 0, & \text{for } \alpha > 1 \end{cases}$$
 7 M

5. a) Find the inverse Z-transform of $\frac{8z - z^3}{(4 - z)^3}$ 7 M

b) Solve the difference equation

$$y_{n+2} - 6y_{n+1} + 8y_n = 2^n + 6n \text{ by using Z-transform.}$$
 7 M

6. a) Express $\int_0^1 x^m (1 - x^n)^p dx$ in terms of gamma function

and evaluate $\int_0^1 x^5 (1 - x^3)^{10} dx$ 7 M

b) Prove that $\iint_D x^{l-1}y^{m-1}dxdy = \frac{\Gamma(l)\Gamma(m)}{\Gamma(l+m+1)} h^{l+m}$ where
 D is the domain $x \geq 0, y \geq 0$ & $x + y \leq h$ 7 M

7. a) Fit a parabola of the form $y = a + bx + cx^2$ to the following data

x	1	2	3	4
y	1.7	1.8	2.3	3.2

7M

b) The voltage v across a capacitor at a time t seconds is given by the following table

t	0	2	4	6	8
v	150	63	28	12	5.6

7M

Use the method of least squares, to fit a curve of the form $v = ae^{kt}$ to this data.

8. a) Form the partial differential equation of

$z = f_1(y + 2x) + f_2(y - 3x)$ by the eliminating arbitrary functions. 7 M

b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$ 7 M