

Code: CE2T1, ME2T1, CS2T1, IT2T1, EE2T1, EC2T1, AE2T1

I B.Tech - II Semester – Regular Examinations – April 2016

ENGINEERING MATHEMATICS - II
(Common for all Branches)

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

a) Find the rank of $\begin{bmatrix} 1 & 4 & 5 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

b) Show that the vectors $X_1=(2, -2, 1)$, $X_2=(1, 4, -1)$, and $X_3=(4, 6, -3)$ are linearly independent.

c) If $\lambda_1, \lambda_2, \dots, \lambda_n$ are Eigen values of a Matrix A then prove that A^{-1} has the Eigen values of $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \dots, \frac{1}{\lambda_n}$

d) Find the Eigen values of the matrix $\begin{bmatrix} 6 & 8 \\ 8 & -6 \end{bmatrix}$

e) Find Laplace transformation of $\sin^3 2t$

f) Find Laplace transformation of $\frac{\sin 2t}{t}$

g) Find the value of a_0 for the function $f(x)=x$ in $0 < x < 2$

h) Define Fourier sine and cosine transforms of the function $f(x)$

i) Find the Fourier sine transformation of $\frac{1}{x}$

j) Evaluate the inverse Z-transformation of

$$e^{1/z} + \frac{z(z - \cos\theta)}{z^2 + 2z\cos\theta + 1}$$

k) Evaluate $z \left[\frac{1}{(n+1)!} \right]$

PART – B

Answer any **THREE** questions. All questions carry equal marks.

16 x 3 = 48 M

2.

a) Solve the following equations by Gauss-Jordan method

$$x + 2y + z - w = -2, \quad 2x + 3y - z + 2w = 7, \quad x + y + 3z - 2w = -6, \\ x + y + z + w = 2.$$

8 M

b) Apply Gauss-Sidel iteration method to solve the equations.

$$20x + y - 2z = 17, \quad 3x + 20y - z = -18, \\ 2x - 3y + 20z = 25$$

8 M

3.

a) Find the characteristic equation of the matrix

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix} \text{ and hence, find the matrix represented}$$

$$\text{by } A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I. \quad 8 \text{ M}$$

b) Find the Eigen values and Eigen vectors of the

$$\text{matrix } \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

8 M

4.

a) Find the inverse Laplace Transform of $\frac{s}{s^4+s^2+1}$ 8 M

b) Solve the equation $\frac{d^2 x}{dt^2} + 2 \frac{dx}{dt} + 5x = e^{-t} \sin t$, $x(0) = 0$,
 $x'(0) = 1$ 8 M

5.

a) Obtain Fourier series for the function

$$\begin{aligned} f(x) &= \pi x & 0 \leq x \leq 1 \\ &= \pi(2-x) & 1 \leq x \leq 2 \end{aligned} \quad 8 \text{ M}$$

b) Find the Fourier transformation of

$$\begin{aligned} f(x) &= 1 - x^2 & \text{if } |x| < 1 \\ &= 0 & \text{if } |x| > 1 \end{aligned} \quad \text{and hence evaluate}$$

$$\int_0^{\infty} \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx \quad 8 \text{ M}$$

6.

a) Use convolution theorem to evaluate $Z^{-1} \left[\frac{z^2}{(z-a)(z-b)} \right]$ 8 M

b) Solve $u_{n+2} + u_n = \cos \frac{n}{2}$ 8 M