

B.Tech. (Sem.III) (Main/Back) Examination-2014
Electrical Engineering
3EE6 Advanced Engineering Mathematics

Time : 3 Hours]

[Total Marks : 80

[Min. Passing Marks : 24

Instructions to Candidates :

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT-I

1. (a) Find the Laplace transform of the following :

(i) $1 - t^2 + e^t$

(ii) $\sin \sqrt{t}$

(8)

- (b) Find the Inverse Laplace transform of:
- $\frac{s}{s^4 + 4a^4}$

(8)

OR

1. (a) Solve the following differential equation :

$(D^2 + 3D + 2)y = 1, D \equiv \frac{d}{dt}$ with $y(0) = 0, y'(0) = 0$

(8)

- (b) Solve the following differential equation :

$$\frac{\partial u}{\partial t} = 3 \frac{\partial^2 u}{\partial x^2}$$

Boundary condition:

$$u\left(\frac{\pi}{2}, t\right) = 0, \left(\frac{\partial u}{\partial x}\right)_{x=0} = 0, u(x, 0) = 30 \cos 5x.$$

(8)

UNIT-II

2. (a) Find the Discrete Fourier Transform (DFT) of the sequence :
- $\{g_k\} = \{1, 0, -1\}$

(8)

- (b) Find the Fourier transform of the function

$$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$$
 and hence evaluate :

$$\int_0^{\infty} \frac{\sin s}{s} ds$$

(8)

OR

2. (a) Find the Fourier sine and cosine transform of the function :
- $f(x) = x$

(8)

- (b) Solve the following partial differential equation:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

with $u_x(0, t) = 0, u(x, 0) = \begin{cases} x, & 0 \leq x \leq 1 \\ 0, & x > 1 \end{cases}$ and $u(x, t)$ is bounded and $x > 0, t > 0$.

(8)

UNIT-III

3. (a) Find Fourier series for the function
- $f(x) = x \sin x, -\pi < x < \pi$
- .

(8)

- (b) Find the cosine series of
- $\sin x$
- in the interval
- $0 < x < \pi$
- .

(8)

OR

3. (a) Derive the following Euler-Lagrange's equation
- $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y'} \right)$

Where $f = f(x, y, y')$ and $y' = \frac{dy}{dx}$

(8)

- (b) Find the external for the functional
- $\int_1^2 \frac{\sqrt{1+y'^2}}{x} dx$
- with
- $y(1) = 0, y(2) = 1$

(8)

4. (a) Examine the nature of the function $f(Z) = \frac{x^3 y(y-ix)}{x^6 + y^2}$, $Z \neq 0$, $f(0) = 0$ in the region including the origin.
- (b) Find the bi-linear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $z < 1$.

OR

4. (a) State and prove Cauchy's integral theorem.
- (b) Evaluate the following by using Cauchy's integral formula $\int_c \frac{e^{2z}}{(z+1)^4} dz$ where c is a circle $|z|=3$.

UNIT - V

5. (a) Expand the following function $\frac{1}{z(z^2 - 3z + 2)}$ in Laurent's series for the regions

- (i) $0 < |z| < 1$
 (ii) $1 < |z| < 2$
 (iii) $|z| > 2$

- (b) Find the poles for the following functions

(i) $\frac{1}{\sin z - \cos z}$

(ii) $\frac{z^2}{(z+1)(z-2)^2}$

Also determine the order of each pole.

OR

5. (a) Evaluate the following integral by using residue theory: $\int_c \frac{1-2z}{z(1-z)(z-2)} dz$; $c: |z|=1.5$

(b) Show that $\int_0^{2\pi} \frac{d\theta}{(5-3\sin\theta)^2} = \frac{5\pi}{32}$

RTUPAPER.COM

RTUPAPER.COM