

3E1646

Roll No. _____

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B. Tech. (Sem. III) (Mercy Back) Examination, December - 2017
Electrical Engg.
3EE6A Advanced Engg. Mathematics - I

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

*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.*

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. _____ Nil 2. _____ Nil

UNIT - I

1 (a) Find the Laplace transform of $te^{at} \sin at$.

4

(b) Evaluate $L^{-1} \left\{ \frac{1}{S^3(S^2+1)} \right\}$.

4

(c) Solve the following differential equation using Laplace transform technique.

$$(D^2 - 3D + 2)x = 1 - e^{2t}, x(0) = 1, x'(0) = 0$$

8

OR

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1

[P.T.O.

- 1 (a) Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.

4

- (b) Evaluate the following $L^{-1} \left\{ \frac{e^{-5S}}{(S-2)^4} \right\}$.

4

- (c) Solve

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

subject to the constraints

$$u(x, 0) = 3 \sin 2\pi x, u(0, t) = 0 = u(1, t) \text{ where } 0 < x < 1, t > 0.$$

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UNIT - II

- 2 (a) Express $f(x) = \begin{cases} 1, & 0 \leq x \leq \pi \\ 0, & x > \pi \end{cases}$
as a Fourier sine integral and hence evaluate

$$\int_0^\infty \frac{1 - \cos \pi S}{S} \sin x S dS$$

8

- (b) Obtain the discrete Fourier transform of the sequence
 $\{g_k\} = \{1, 0, -1\}$

8

OR

- 2 (a) Find the Fourier transform of $f(x) = \begin{cases} 1, & |x| \leq a \\ 0, & |x| > a \end{cases}$. Also evaluate

$$\int_{-\infty}^{\infty} \frac{\sin \lambda a \cos \lambda x}{\lambda} d\lambda.$$

8

- (b) Solve the following Partial differential equation

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

given $u(0, t) = u_0, t > 0$

$$u(x, 0) = 0, x > 0$$

Also, u and $\frac{\partial u}{\partial x}$ approach to zero as $x \rightarrow \infty$.

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UNIT - III

- 3 (a) Find the Fourier series to represent

$$f(x) = |x| \text{ for } -\pi < x < \pi$$

8

- (b) Obtain the shortest distance curve between two given points in a plane.

8

OR

- 3 (a) Find Half range sine series for the function

$$f(x) = 2x - 1 \text{ in } 0 < x < 1$$

8

- (b) Find a plane curve of fixed Perimeter and Maximum Area.

8

UNIT - IV

- 4 (a) Determine the Analytic function $w = u + iv$ if

$$u = e^{2x} (x \cos 2y - y \sin 2y)$$

8

- (b) Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ in to the straight line $4u + 3 = 0$.

8

OR

- 4 (a) Find the Bilinear transformation which transform the point $z = 2, 1, 0$ in to $w = 1, 0, i$ respectively.

8

- (b) Evaluate the following integral

$$\oint_C \frac{1-2z}{z(z-1)(z-2)} dz \text{ where } C \text{ is the circle } |z|=1.5.$$

8

UNIT - V

- 5 (a) Expand the function $\frac{1}{(z-1)(z-2)}$ for

- (i) $|z| < 1$
(ii) $|z| > 2$
(iii) $1 < |z| < 2$
in Laurent's series.

8

- (b) Find the residue of $\frac{z^2-2z}{(z+1)^2(z^2+4)}$ at all its poles in the finite plane.

8

OR

- 5 (a) Use Cauchy Residue theorem to evaluate the following integral :

$$\oint_C \frac{z-1}{(z+1)^2(z-2)} dz, \quad C: |z-i|=2$$

8

- (b) Evaluate

$$\int_0^{\infty} \frac{dx}{(x^2+1)^2}$$

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