

Total No. of Questions: 22

Total No. of Pages: 02

Roll No. _____

Paper Code

3E1216

B.Tech. III-Sem (Main & Back) January-2026

Electrical & Electronics Engg.

3EX2-01 Advance Mathematics

EE, EX

3E1216

Time : 3 Hours

Maximum Marks : 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

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. _____

2. _____

Part-A

(Answer should be given up to 25 words only)

All questions are compulsory

10x2=20

- Q. 1 Find $\Delta \left[\frac{2^x}{(x+1)!} \right]$
- Q. 2 Prove that $\left(\frac{\Delta^2}{E} \right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x} = e^x$
- Q. 3 Define Lagrange's interpolation formulae for n observations.
- Q. 4 Write the rate of convergence and iteration formulae of Regula Falsi method.
- Q. 5 Find the Laplace transform of $\sin^5 t$.
- Q. 6 Define second shifting property of Laplace transform.
- Q. 7 Examine Fourier transform of $f(x) = \begin{cases} 1-|x| & |x| < 1 \\ 0, & |x| > 1 \end{cases}$
- Q. 8 What do you mean by region of convergence (ROC) of z-transform? Explain.
- Q. 9 Write sufficient condition for $f(z)$ to be analytic.
- Q.10 Explain conformal and Isogonal mapping of a complex function.

Part B

(Analytical/Problem solving questions)

Attempt any Five questions.

5x4=20

Q. 1

Evaluate $\int_0^5 \frac{dx}{4x+5}$ by using Simpson's 1/3 rule, taking 10 equal parts. Hence, find the approximate value of $\log_e 5$.

Q. 2

Find the Fourier Cosine transform of $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$

Q. 3

The population of a town, as obtained from census data, is shown in the following table. Using Newton Gregory interpolation formula, find the population of year 1936.

Year	1921	1931	1941	1951	1961
Population (in thousands)	19.96	39.65	58.81	77.21	94.61

Q. 4

Show that $f(z) = z|z|$ is not analytic anywhere.

Q. 5

Find the real root of the equation $3x = \cos x + 1$, by Newton Raphson method correct up to four decimal places.

Q. 6

Find the analytic function $f(z) = u + iv$, whose real part u is $\frac{x}{x^2 + y^2}$.

Q. 7

Evaluate the given integral using Laplace transform : $\int_0^\infty e^{-4t} \cosh^3 t \, dt$

Part C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions.

3x10=30

Q. 1

Using Stirling's formula, estimate the value of $\tan 16^\circ$

x°	0°	5°	10°	15°	20°	25°	30°
$y = \tan x$	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

Q. 2

Solve the following problems:-

(a) Find the Z-transform of $f(k) = 3(2^k) - 4(3^k), k \geq 0$

(b) Using Laplace transform, show that $\int_0^\infty e^{-t} t^3 \sin t \, dt = 0$

Q. 3

Evaluate $\int_0^\pi \frac{\sin^2 x}{5 + 4 \cos x} \, dx$ by using Trapezoidal rule and Simpson's 3/8 rule.

Q. 4

Find the image of the strip $\frac{1}{4} \leq y \leq \frac{1}{2}$ under the transformation $w = \frac{1}{z}$. Also, show the regions graphically.

Q. 5

Find the Fourier sine and cosine transforms of: (a) x^{n-1} (b) $\frac{1}{\sqrt{x}}$