Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination November 2025

Roll no.....

Name of the Course and semester: B.Tech. ECE III
Name of the Paper: Advanced Engineering Mathematics
Paper Code: BSC 301

Time: 3 hour Maximum Marks: 100

Note:

(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks)

a. Find the Fourier sine and cosine transform of e^{-x}. CO2

b. Using convolution theorem to find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{3}\right)}$. CO2

c. Solve the following difference equation by Z-transform: CO2

$$y_{n+2} - 3y_{n+1} + 2y_n = 0; \quad \text{given } y_0 = 0 \text{ and } y_1 = 1.$$

Q2. (2X10=20 Marks)

a. Find the analytic function $f(z)$ of which the real part is $e^{-x}[(x^2 - y^2)\,cosy + 2xy\,siny]$. CO1

b. Evaluate $\int_{(1,1)}^{(2,4)}(x^2 + ixy)dz$ along the curve $x = t$ and $y = t^2$. CO1

c. Evaluate $\oint_C \frac{e^{2z}}{(z+1)^4}dz$, where C: $|z| = 3$. CO1

Q3. (2X10=20 Marks)

a. Find the Taylor's and Laurent's series which represents the function $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ in the region $2 < |z| < 3$. CO4

b. Evaluate the residues of $\frac{z^2}{(z-1)(z-2)(z-3)}$ at $z = 1, 2, 3$ and infinity and show that their sum is zero. CO4

c. Find the bilinear transformation which maps the points $z = 1, -i, -1$ correspond to $w = i, 0, -i$ respectively. CO4

Q4. (2X10=20 Marks)

a. The probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} kx^2; & 0 < x < 1 \\ 0; & \text{otherwise} \end{cases}$$

Find the value of k and hence compute its mean, variance and standard deviation. CO3

b. If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001. Find the probability that out of 2000 individuals (i) exactly 3 (ii) more than 2 individuals and (iii) none of them suffer from bad reaction. CO3

c. Compute skewness and kurtosis, if the first four moments of a frequency distribution $f(x)$ about the value $x = 4$ are respectively 1, 4, 10 and 45. CO3

Q5. (2X10=20 Marks)

a. Fit a straight line $y = a + bx$ to the following data: CO5

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	5

b. Find the most likely price in city B corresponding to the price of Rs. 70 at city A from the following data:

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	City *A*	City *B*
Average price	65	67
Standard deviation	2.5	3.5

Correlation coefficient between the prices of commodities in two cities is 0.8. CO5

c. Find the correlation coefficient between x and y from the given data: CO5

x	78	89	97	69	59	79	68	57
y	125	137	156	112	107	138	123	108