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

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

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

Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. (10 Marks)

a. Find the Fourier series expansion of the function

$$f(x) = x^2, \quad -2 \le x \le 2.$$

OR (CO1)

b. Find the Fourier sine series of the function

$$f(x) = \begin{cases} x^2, & 0 < x < 1 \\ 1, & 1 \le x < 2 \end{cases}$$

Q2. (10 Marks)

a. Find the inverse Z transform of $F(z)$, where $F(z)$ is given by

$$\frac{7z - 11z^2}{(z-1)(z-2)(z+3)}$$

OR (CO1)

b. Solve the following difference equation using Z transform

$$y_{n+2} + 5y_{n+1} + 4y_n = 2^n, \quad y_0 = 1, y_1 = -4.$$

Q3. (10 Marks)

a. Show that the function $f(z) = \sin z$ is analytic in the finite z-plane. Hence obtain its derivative.

OR (CO2)

b. Show that $f(z) = \bar{z}$ is continuous at $z = 0$ but not differentiable at $z = 0$.

Q4. (10 Marks)

a. Show that the function $u(x, y) = x^2 - y^2$ is harmonic function. Also find the analytic function $f(z) = u(x, y) + iv(x, y)$.

OR (CO2)

b. Evaluate $\int_C (z^2 + 3z)dz$ along
(i) the straight line from (2, 0) to (0, 2)
(ii) the straight lines (2, 0) to (2, 2) and then from (2, 2) to (0, 2).

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Q5. (10 Marks)

a. Verify Cauchy's integral theorem for z^2 taking over boundary of rectangle with vertices $-1, 1, 1 + i$ and $-1 + i$ in counter-clockwise direction.

OR (CO2)

b. Evaluate using Cauchy Integral formula:
$\int_C \frac{e^{2z}}{z(1+z)^4} dz$, C: the circle $|z| = 2$ oriented counter-clockwise.