Set A

KATHMANDU UNIVERSITY

Subject: MATH 207 — **Second In-Semester Exam - 2025** — **CS-II-II**

Time: 1 hr — **F.M.: 5Q×4= 20**

1. Fill in the blank spaces and write the appropriate answers in your answer book.

   (a) The solution $u(x, y)$ of the PDE $u_{yy} = 0$ is ________.

   (b) The radius of convergence of the series: $\sum_{n=0}^{\infty} \frac{(2n)!}{(n!)^2}(z-3i)^n$ is ________.

   (c) The residue of $f(z) = \frac{\sin z}{z^4}$ is ________.

   (d) A bilinear transformation which maps $i, 1, -i$ onto three points $1, 0, -1$ respectively, is ________

2. Transform the following equation into normal form and solve $x^2u_{xx} - 2xyu_{xy} + y^2u_{yy} + xu_x + yu_y = 0$.

3. (a) What is simply connected and multiply connected domain? Is it possible to reduce the multiply connected domain into simply connected domain? Support your argument. State and proof the Cauchy residue theorem.

   (b) Solve $\ln z = 4 - 3i$.

4. (a) If $\mathcal{L}[f(t)] = F(s)$, that is, if the Laplace transform of $f(t); t \geq 0$ exists, then prove that $\mathcal{L}[f'(t)] = s\mathcal{L}[f(t)] - f(0) = sF(s) - f(0)$.

   (b) Find the convolution of: $\sin \omega t * \sin \omega t$.

5. (a) Evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)} dz.\ C : |z| = \frac{3}{2}$.

   (b) Define pole, singularities and residue. Evaluate $\int_{-\infty}^{\infty} \frac{dx}{x^4 - 1}$.