THE OPEN UNIVERSITY OF SRI LANKA

B.Sc./B.Ed DEGREE PROGRAMME-LEVEL 05

NO BOOK TEST-2023/2024

ADU5306 — FLUID MECHANICS

DURATION: ONE HOUR

Date: 09.02.2024   **Time: 2.30 p.m. –3.30 p.m.**

ANSWER All QUESTIONS.

1.   a) State the Bernoulli's theorem for a fluid which is in steady motion without velocity potential and conservative field of force.

b) A stream in a horizontal pipe, after passing a contraction in the pipe at which its sectional area A is delivered atmospheric pressure at a place, where the sectional area is B. Show that if a side tube is connected with the pipe at the former place, water will be sucked up through it into the pipe from reservoir at a depth

$$\left(\frac{s^2}{2g}\right)\left(\frac{1}{A^2} - \frac{1}{B^2}\right)$$

below the pipe, s being the delivery per second.

2.   a) State the Kelvin's theorem.

b) Show that the function $\emptyset = U\left[r + \frac{a^2}{r}\right]\cos\theta - k\theta$, where the constants U, a, k are positive constants and (r, θ, z) denotes cylindrical polar coordinates, represents velocity potential of an irrotational motion of an incompressible fluid, by verifying that the velocity derived from it satisfies the equation of continuity. Find the velocity at infinity and the velocity at any point on the cylinder $r = a$. Show that there is a constant circulation in any circuit surrounding the cylinder.