



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

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COIMBATORE-641 035, TAMIL NADU



DEPARTMENT OF AEROSPACE ENGINEERING

Faculty Name : **Dr.A.Arun Negemiya,** Academic Year : **2024-2025 (Odd)**
AP/ Aero
Year & Branch : **II AEROSPACE** Semester : **III**
Course : **23AST202 – Fluid Mechanics for Aerospace**

UNIT V – TURBINES

A Kaplan turbine plant develops 3000 kW under a head of 10 m. While running at 62.5 rpm.

The discharge is 350 m³/s. The tip diameter of the runner is 7.5 m and the hub to tip ratio is

0.43. Calculate the specific speed, turbine efficiency, the speed ratio and flow ratio.

Speed ratio is based on tip speed.

Hub diameter = $0.43 \times 7.5 = 3.225$ m

Turbine efficiency = $P / \rho Q H g$

$$= \frac{30000 \times 10^3}{1000 \times 350 \times 10 \times 9.81} = 0.8787 \text{ or } 87.87\%$$

$$\text{Specific speed} = \frac{60}{60} \cdot \frac{\sqrt{30,000 \times 10^3}}{10^{1.25}} = 308$$

$$\text{Runner tip speed} = \frac{\pi \times 7.5 \times 60}{60} = 23.56 \text{ m/s}$$

$$\therefore \text{Speed ratio} = 23.56 / \sqrt{2 \times 9.81 \times 10} = 1.68$$

$$\text{Flow velocity} = \frac{350 \times 4}{\pi (7.5^2 - 3.225^2)} = 9.72 \text{ m/s}$$

$$\therefore \text{Flow ratio} = 9.72 / \sqrt{2 \times 9.81 \times 10} = 0.69.$$