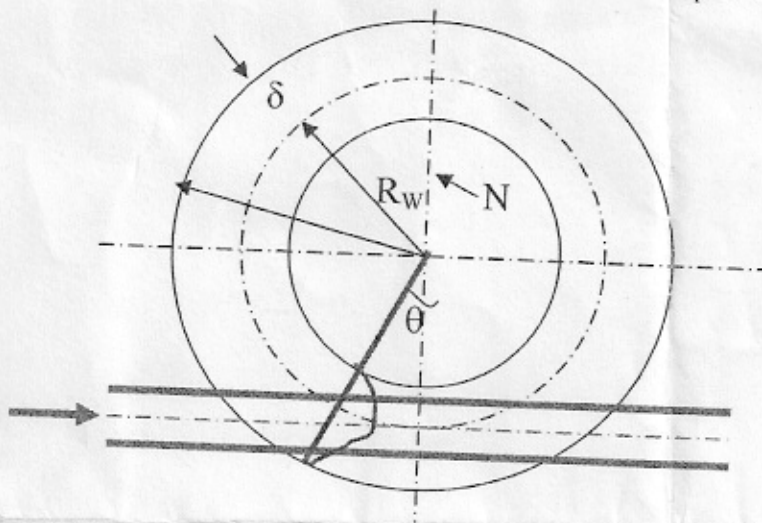


TIME: 60 min.

MAX. MARKS: 40

Problem 1: The Pykara Power House is equipped with a Pelton Wheel. The wheel works under a head of 855 m with a flow rate of $6,822 \text{ m}^3/\text{hr}$. Following Sketch shows the instantaneous position of one bucket of the wheel.



Wheel Radius: $R_w = 1,850 \text{ mm}$

Minimum Jet Diameter, $d_{\text{jet, vc}} = 137.2 \text{ mm}$

Position of bucket, $\theta = 10^\circ$

Wheel speed = 600 RPM

Draw instantaneous velocity triangles at the inlet and exit of the bucket and calculate the instantaneous power developed by the bucket.

Problem 2: The Churchill Falls Power House, Labrador, Canada is using a Francis turbine. The turbine works under a head of 316 m and develops a power of 6,18,000 hp. Select a suitable speed to this runner and design a guide vane system for this runner. Verify and prove that your design is valid in all respects. (15 marks)

Problem 3: Derive an expression for the power transferred to the fluid in an axial pump. (15 marks)

Problem 4: Draw characteristic curves of a forward vane fan and explain the advantage and disadvantage of this design. (5 marks)

(5 marks)