

SECTION-B

2. A jet of water moving at 12 m/s impinges on vane shaped to deflect the jet through 120° when stationary. It vane is moving at 5 m/s and inlet and outlet blade angles are equal, find the angle of jet, velocity of whirl and relative velocity at inlet.
3. How would you proceed to design a Francis turbine ? Explain by drawing velocity triangles.
4. Show that the pressure rise in impeller of a centrifugal pump is given by

$$\Delta_p = \frac{1}{2g} \left[V_{f1}^2 - u_2^2 - v_{f2}^2 \operatorname{cosec}^2 \phi \right]$$

with usual notations.

5. Show that Pelton turbine is a low specific speed turbine.
6. The length and dia of a single acting reciprocating pump are 30 m and 10 cm respectively and water is delivered to a tank which is 20 m above the centre of pump. Find head due to acceleration at the beginning of delivery stroke. The stroke length 35 cm. Pump speed = 3.5 rpm.

SECTION-C

7. Explain the construction and operation of a differential accumulator by means of a neat diagram.
8. A Kaplan turbine is to be designed to develop 7357.5 kW shaft power. The available head is 5.5 m. Assume speed ratio 2.09, flow ratio 0.68 and overall η is 60%. The Boss diameter is $\frac{1}{3}$ of runner diameter. Find diameter of runner and speed of turbine.
9. Write notes on the followings :
 - (a) Cavitation in hydraulic turbines.
 - (b) Shape of buckets of Pelton turbines.