

SECTION-B

2. A 4 cm dia jet with velocity of 30 m/c enters a stationary curved vane at 40° with horizontal and leaves at 20° with horizontal so that total deflection is 120°. Find magnitude and direction of force on vane.
3. Discuss the factors for selection of turbines in a hydropower plant. What are various losses in such plants ?
4. Discuss the various steps in the design of a Francis turbine. What do you understand by runaway speed ?
5. Find number of pumps required to take water from a deep well under a total head of 89 m. All pumps are identical and run at 800 r.p.m. The specific speed of each pump is 25 which deliver 0.016 m³/s of water.
6. Derive an expression for the head lost due to friction in delivery pipe of a reciprocating pump with and without air vessel in a double acting pump.

SECTION-C

7. A Kaplan turbine is to be designed for developing 9100 kW. The net head available is 5.6. The speed ratio is 2.09 and flow ratio is 0.68. The overall η is 86% and Boss dia is 1/3 of runner dia. Find dia of runner, speed and specific speed of turbine.
8. Prove that the manometric head of a centrifugal pump can be written as $H_m = AN^2 + BNQ + CQ^2$ where N is speed, Q is discharge and A, B, C are constant.
9. Write notes on the following :
 - (a) Thoma Cavitation Number and its significance.
 - (b) Performance characteristics of centrifugal pumps and Francis turbines.