

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 140651

Roll No.

B.TECH.

Theory Examination (Semester-VI) 2015-16

FLUID MACHINERY

Time : 3 Hours

Max. Marks : 100

Section-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. Assume any missing data suitably. (2×10=20)

- (a) Explain hydroelectric power plant with the help of neat sketch.
- (b) What is the function of nozzle in an impulse turbine.
- (c) Define different heads and efficiencies of turbine.
- (d) Why spiral casing of varying area is employed in reaction turbine.
- (e) Write down the advantages of multistaging in centrifugal pump.
- (f) What is purpose of priming of a centrifugal pump?

(1)

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- (g) Mention the main components of a reciprocating pump.
- (h) When will you select reciprocating pump.
- (i) Write down the purpose of a hydraulic accumulator.
- (j) State the function of a torque convertor.

Section-B

2. Attempt any five questions from this section. (10×5=50)

- (a) A jet of water having diameter of 5 cm and velocity 20 m/s impinges on
 - (i) A normal flat plate moving in the direction of jet at 7.5 m/s.
 - (ii) On a series of normal flat plates mounted on a wheel which has tangential velocity of 7.5 m/s. Calculate force exerted, work done and efficiency in both cases.
- (b) The penstock supplies water from a reservoir to the pelton wheel with a gross head of 500 m. One-third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of penstock is 2 m³/s. The angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency of the pelton wheel. Take speed ratio = 0.45 and $C_v = 1$.

(2)

- (c) What are the functions of governing of a hydraulic turbine? Explain governing mechanism of an impulse turbine.
- (d) What is NPSH? What is the purpose of multistaging in centrifugal pump? What are its advantages?
- (e) An inward flow reaction turbine has a flow rate of $0.3\text{m}^3/\text{s}$ and it works under the head of 30m. The velocity of wheel at inlet is 20m/s. Water discharges through a pipe at exit of 0.3 diameter in radial direction. Determine the guide vane angle at inlet power to runner and hydraulic efficiency. Velocity of flow remains constant through out the runner.
- (f) What is draft tube? Why it is used in reaction turbine? Describe with sketch two different type of draft tube.
- (g) A centrifugal pump delivers 1.27m^3 of water per minute at 1200 rpm. The impeller diameter is 350mm and breadth at outlet is 12.7 mm. The pressure difference between inlet and outlet of pump casing is 272 kN/m^2 . Calculate the impeller exit blade angle if manometric efficiency is 63%.
- (h) A single acting pump has a piston diameter of 150mm and the crank radius of 300 mm. The delivery pipe is 75 mm diameter and 30 m long. The water is lifted to 30 m above the centre of pump. Find the maximum speed at which the pump may be run so

that no separation takes place during the delivery stroke . Neglect the velocity head in delivery pipe and assume separation occurs at 2.5 of water head absolute.

Section-C

Note: Attempt any two questions from this section. (15×2=30)

3. Explain the performance characteristic curves for turbines. Also define specific speed of a centrifugal pump. Derive an expression for the same.
4. Explain the functions of a volute casing of a centrifugal pump. A centrifugal pump discharges $57 \text{ m}^3/\text{s}$ water when operated by a motor running at 1760 rpm. The flow is radial at inlet and the relative velocity of 15 m/s makes an angle of 25° with the tangent to the periphery. If the pump efficiency is 70% and motor efficiency is 80%. Find the input power to the motor. Impeller diameter of the pump is 37.5 cm.
5. Explain indicator diagram for reciprocating pump with the help of neat sketch. A single acting reciprocating pump running at 60 rpm has its piston area of 80 cm^2 and stroke length 150 mm. The area of suction pipe is 60 cm^2 . The suction head is 3 m. Assuming a friction factor of 0.04. Find the pressure head on the piston at the beginning, middle and at the end of suction stroke if the length of suction pipe is 6m. Assume motion of piston as S.H.M. Can cavitation take place if the working liquid is water.