(Following Paper ID and Roll No. to be filled in your Answer Books)	
Paper ID : 140666	Roll No.

B. TECH.

Theory of Examination (Semester-VI) 2015-16

FLUID MACHINERY

Time : 3 Hours *Max. Marks : 100*

Section-A

1. Attempt all parts. All parts carry equal marks. Writer answer of each part in short. (2×10=20)

(a) What are fluid machines or Hydraulic Machines?

(b) Define Runaway speed of Turbine.

(c) Differentiate between impulse turbine and a reaction turbine?

(d) Why do draft tubes have enlarging passage area in the direction of flow?

(e) List the characteristic curves of Hydraulic turbine.

(f) Differentiate between Static Head and Manometric Head.

(g) What is the purpose of Priming of a centrifugal pump?

(h) What is the purpose of an air vessel fitted in the pump?

(i) What do you mean by Maximum speed of a Reciprocating Pump?

(j) What will be the total % work saved by fitting the air vessel? Explain.

Section-B

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

(a) (i) In brief, explain the Classification of fluid machines.

(ii) Explain the principle of moment of momentum equation and their applications.

(b) (i) Define Absolute Path, Absolute Velocity, Relative Path, Relative Velocity

(ii) A jet of water of diameter 50 mm having a velocity of 20 m/sec strikes a curved vane which is moving with a velocity of 10 m/sec in the direction of jet. The jet leaves the vane at an angle of 60 degree to the direction of motion of vane at outlet. Determine (i) force exerted by the jet on the vane in the direction of motion (ii) Work done per second by the jet.

(c) (i) Draw inlet and outlet velocity triangles for a pelton wheel and indicate the direction of velocities.

(ii) A pelton wheel has a mean bucket speed of 10 m/sec with a jet of water flowing at a rate of 700 lit/sec under a head of 30m. The buckets deflects the jet through an angle of 160 degree. Calculate power and hydraulic efficiency.

(d) A Kaplan Turbine runner is to be designed to develop 9100 kw. The net available head is 5.6 m. If the speed ratio=2.09, flow ratio=0.68, overall efficiency 86% and the diameter of the boss 1/3 the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.

(e) Define Specific Speed of a centrifugal pump and derive the equation for the same.

(f) With the help of a neat sketch explain the working principle of reciprocating pump.

(g) In a hydraulic ram installation the supply pipe is 6cm. in diameter and 5m long. The level of the supply reservoir is 2m above the hydraulic ram. The waste valve is 15cm. diameter and has an effective lift of 0.5cm and weighs 14.72 N. Estimat the quantity of water delivered per second in a tank 10 m above the ram. Also calculate the number of beats per minute.

(h) With the help of a neat sketch explain the working principle of hydraulic ram and hydraulic press.

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

3. (a) Explain the functions of the following parts of reaction tubine:

(i) Scroll casing (ii) Draft tube

(iii) Guide blades (iv) Runner

(b) Determine the power given by the jet of water the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50m and discharge through the jet water is 0.03 m^3/s. The side clearance angle is 15^0 and take C_v=0.975.

4. (a) Explain the torque converter and fluid coupling with neat sketch.

(b) A single-acting reciprocating pump runnint at 50 rpm delivers 0.01 m^3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine (i) the theoretical discharge of the pump (ii) Co-efficient of discharge (iii) slip and percentage slip of the pump.

5. (a) Show that the work saved in overcoming friction in the pipelines by fitting air vessels is 84.8% for a single acting-reciprocating pump.

(b) A centrifugal pump runs at 950 rpm, its outer and inner diameters are 500 mm and 250 mm. The vanes are set back at 35° to the wheel rim. If the radial velocity of

water through the impeller is constant at 4 m/s, find (a) the angle of vane at the inlet. (b) the velocity of water at exit (c) the direction of water at the outlet (d) the work done by the impeller per kg of water. Assume entry of water at inlet is radial.