

B.TECH.

THEORY EXAMINATION (SEM-IV) 2016-17

FLUID MACHINERY

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. Explain the following:

10 x 2 = 20

- (a) Torque convertor
- (b) Hydraulic Ram
- (c) Hydraulic Accumulator
- (d) Hydraulic Intensifier
- (e) Air Lift Pump
- (f) Priming
- (g) Principle of Turbo-machine
- (h) Jet Pump
- (i) Air vessels
- (j) Slip, Negative slip

SECTION – B

2. Attempt any five parts of the following questions:

5 x 10 = 50

- (a) Derive the expression of Euler's equation and hence deduce the Bernoulli's equation.
- (b) A plate is acted upon at its center by a jet of water of diameter 20 mm with a velocity of 20 m/s. The plate is hinged and is deflected through an angle of 15° . Find the weight of the plate. If the plate is not allowed to swing, what will be the force required at the lower edge of the plate to keep the plate in vertical position.
- (c) Design a Pelton wheel for a head of 80 m and speed 300r.p.m. The Pelton wheel develops 103 kW S.P. Take $C_v = 0.98$, speed ratio = 0.45 and overall efficiency = 0.80.
- (d) Derive the expression of maximum efficiency of Pelton Turbine.
- (e) Explain with neat diagram Governing of Pelton Turbine.
- (f) A lawn sprinkler with two nozzles of diameter 4 mm is connected across a tap of water. The nozzles are at a distance of 30 cm and 20 cm from the center of the tap. The rate of flow water through the tap is $120\text{ cm}^3/\text{s}$. the nozzles discharge water in the downward direction. Determine the angular speed at which the sprinkler will rotate free.
- (g) Draw all the characteristic curves for reaction turbines.
- (h) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200r.p.m. works against a total head of 75 m. The velocity of flow through the impeller is constant and equal to 3 m/s. The vanes are set back at an angle of 30° at outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm, determine: (a) vane angle at inlet, (b) work done per second by impeller, (c) manometric efficiency.

SECTION – C

Attempt any two parts of the following questions:

2 x 15 = 30

- 3 An inward flow reaction turbine has an external diameter of 1 m and its breadth at inlet is 200 mm. if the velocity of flow at inlet is 1.5 m/s, find the mass of water passing through the turbine per second. Assume 15% of the area of flow is blocked by blade thickness. If the speed of the runner is 200r.p.m. and guide blades make an angle of 15°

to the wheel tangent, draw the inlet velocity triangle and find: (I) The runner vane angle at inlet (II) Velocity of wheel at inlet, (III) the absolute velocity of water leaving the guide vanes, and (IV) the relative velocity of water entering the runner blade.

- 4 Discuss in detail the effect of acceleration and friction on indicator diagram.
- 5 A turbine is to operate under a head of 30 m at 300r.p.m. The discharge is $10\text{m}^3/\text{s}$. If the efficiency is 90%, determine: (I) specific speed of the machine, (II) Power generated, and (III) types of the turbine