

2007-COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
B.TECH III SEMESTER DEGREE EXAMINATION
FLUID MECHANICS AND HEAT ENGINE

TIME-3HOUR
MARKS-100

JUNE-2007

ANSWER ALL QUESTIONS

SECTION A [8*5=40]

1. a) Explain how fluids are classified. Using stress-strain diagram explain the behaviour of fluids.
- b) Describe differential manometer.
- c) Differentiate the following 1) steady and unsteady flow 2) uniform and non uniform flow.
- d) Explain Froude and Reynolds laws. Give suitable examples where these no.s can be used.
- e) Derive Darcy Weisbach equation for the loss of head due to friction in a pipe.
- f) What is a draft tube? Why is it used in a reaction turbine?
- g) What is specific speed of a turbine? Derive an expression for the same.
- h) What is priming? Why is it necessary?

SECTION B [4*15=60]

2. a) Define the terms: 1) velocity potential function 2) stream function
- b) If for a two dimensional potential flow, the velocity potential = $x(2y-1)$. Determine also the value of stream function at the point.
OR
3. a) Explain the principle of venturimeter with a neat sketch. Derive the expression for the rate of flow of fluid through it.
- b) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60litres/sec. Find the reading of the oil mercury differential manometer. Take $C_d = 0.98$.
4. a) Derive the Hagen- Poiseuille equation.
- b) An oil of viscosity 0.1NS/sq.m and relative density 0.9 is flowing through a circular pipe of diameter 5cm and of length 300m. The rate of flow of liquid through the pipe is 3.5litres/sec. Find the pressure drop in a length of 300m and also the shear stress at the pipe wall.
5. The Pen Stock supplies water from a reservoir to the pelton wheel with a gross head of 500m. 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 the penstock is 2.0meter cube/s. The angle of deflection of the jet is 165 degree. Determine the power given by the water to the turbine and also hydraulic efficiency of the Pelton wheel. Take speed ratio = 0.4S and $C_v = 1.0$.
OR
6. A Kaplan turbine working under a head of 20m develops 1172kw shaft power. The outer diameter of the runner is 3.5m and hub diameter 1.75m. The guide blade angle at the extreme edge of the runner is 35 degree. The hydraulic and overall efficiencies of the turbines are 88% and 84% respectively. If the velocity of whirl is zero at outlet. Determine 1) runner vane angles at inlet and outlet at the extreme edge of the runner and 2) speed of turbine.

7. a) Explain with neat sketches the working of a single stage centrifugal pump.

b) The internal and external diameters of the impeller of a centrifugal pump are 20cm and 40cm respectively. The pump is running at 1200r.p.m. the vane angles of the impeller at inlet and outlet are 20 and 30 degrees respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.

OR

8. A single-acting reciprocating pump has a plunger diameter of 250mm and stroke of 450mm and it is driven with SHM at 60r.p.m. The length and diameter of delivery pipe are 60m and 100mm respectively. Determine the power saved in overcoming friction in the delivery pipe by fitting an air vessel on the delivery side of the pump. Assume friction factor = 0.01.

Educationobserver.com