Code: ME3T3, AE3T3

II B.Tech - I Semester – Regular/Supplementary Examinations November 2018

FLUID MECHANICS AND HYDRAULIC MACHINES
(Common for ME, AE)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks

$$11x \ 2 = 22 \ M$$

1. a) Define specific weight and specific volume and write their units.

   b) Define hydrostatic law.

   c) Define rotational and irrotational flows.

   d) Define hydraulic gradient line.

   e) Define orifice. What are its types?

   f) Define impact of jets.

   g) Define hydraulic turbine. How are they classified?

   h) Define governing of a turbine.

   i) Define specific speed of a centrifugal pump.

   j) Define momentum.

   k) How do you classify reciprocating pumps?

PART – B

Answer any ***THREE*** questions.   All questions carry equal marks.

3 x 16 = 48 M

2. a) Define pressure. Explain classification of manometers.   8 M

   b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left limb is 15 cm below the centre of pipe.   8 M

3. a) Derive Darcy Weisbach equation for loss of head due to friction in pipe.   8 M

   b) The rate of flow of water through horizontal pipe is 0.3 m^3/sec. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The pressure intensity in the smaller pipe is 13.734 N/cm^2. Determine (i) loss of head due to sudden enlargement (ii) pressure intensity in the large pipe.   8 M

4. a) Derive an equation for the impact of jet striking a symmetrical moving curved vane at the centre.   8 M

b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 litres/sec. Find the reading of the oil-mercury differential manometer. Take $C_d = 0.98$.　　　8 M

5. a) Explain characteristic curves of hydraulic turbines.　　　8 M

b) A Kaplan turbine runner is to be designed to develop 7357.5 kW S.P. The net available head is 10 m. Assume that the speed ratio is 1.8 and flow ratio 0.6. If the overall efficiency is 70% and diameter of the boss is 0.4 times the diameter of the runner, find the diameter of the runner and specific speed.　　　8 M

6. a) Explain the following　　　8 M
    (i) Efficiencies of a centrifugal pump.
    (ii) Difference between pumps in series and pumps in parallel.

b) A single acting reciprocating pump has a cylinder of diameter 150 mm and stroke length 300 mm. The centre of the pump is 4 m above the water surface in the sump. The atmospheric pressure head is 10.3 m of water and pump is running at 40 rpm. If the length and diameter of the suction pipe are 5 m and 10 cm respectively, determine the pressure head due to acceleration in the cylinder (i) At the beginning of the suction stroke (ii) In the middle of suction stroke.　　　8 M