

**II B. Tech II Semester Supplementary Examinations, Dec - 2015**  
**FLUID MECHANICS AND HYDRALIC MACHINERY**  
 (Com. to ME, AME)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **THREE** Questions from **Part-B**

**PART-A**

1. a) What is a liquid? Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of  $10 \text{ m}^3$  and weight of 50 kN.
- b) Define the terms velocity potential and stream function.
- c) Briefly explain the characteristics of laminar boundary layer.
- d) How does the specific speed of a centrifugal pump differ from that of a turbine?
- e) How does the losses in the draft tube effect the pressure at runner exit?

(6M+4M+4M+4M+4M)

**PART-B**

2. a) What is the importance of a manometer. Explain the types of manometers in brief.
- b) Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure. (8M+8M)
3. a) Derive the Darcy - Weisbach equation for friction head loss in a pipe .
- b) Draw neat sketches of total energy line and hydraulic gradient line for the following cases and discuss:
  - i) Uniform diameter parallel pipe line
  - ii) Parallel converging pipe line
  - iii) Parallel diverging pipe line. (7M+9M)
4. a) Define displacement thickness. Derive an expression for the displacement thickness.
- b) Oil with a free stream velocity of 1.5m/sec flow over a thin plate 1.4m wide and 2.2m long. Calculate the boundary layer thickness and the shear stress at the trailing end point and determine the total surface resistance of the plate. Take specific gravity of oil as 0.80 and kinematic viscosity as 0.1 stoke. (8M+8M)
5. Derive an expression for the force of jet striking tangentially at the tip of a curved vane which is moving in the direction of jet. Also derive the expression for work done. (16M)
6. Write short notes on
  - i) NPSH
  - ii) Reciprocating pump characteristics (8M+8M)
7. a) A Kaplan turbine has the following details about its draft tube. Find the pressure at inlet of the draft tube.
 

Inlet diameter of draft tube = 2m  
 Out let diameter of draft tube = 3m  
 Velocity of water at outlet = 4.2 m /sec  
 Atmosphere pressure = 10.1 m of water  
 Height of draft tube above tail race = 3.5m  
 Loss of head in draft tube = 0.2 times the velocity head at outlet.
- b) Explain the working, advantages, limitations and applications of amplifier. (8M+8M)

