Code: ME3T3, AE3T3

II B.Tech - I Semester – Regular/Supplementary Examinations November 2019

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 viscosity and write various types of viscosity.

   b) Write about Pascal's law.

   c) Write Bernoulli's equations for flow along a stream line.

   d) List various losses in pipes.

   e) Write about hydrodynamic force.

   f) Define impact of jet.

   g) Write about types of vanes.

   h) What is a draft tube?

   i) Define cavitation.

   j) What is NPSH?

   k) Classify turbines.

PART – B

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

$$3 \times 16 = 48 \text{ M}$$

2. a) What is the difference between U-tube differential
manometer and inverted U-tube differential manometer?
Where are they used?   8 M

   b) A shaft 80mm in diameter is being pushed through a bearing
sleeve 80.01mm in diameter and 300mm long. The clearance
is filled with oil having a kinematic viscosity of 0.005 m²/s
and specific gravity 0.90. If the shaft rotates at 200 rpm, find
the resistance offered by the oil on the shaft.   8 M

3. a) State and explain continuity equation. Derive continuity
equation for one dimensional flow.   8 M

   b) A 300 mm diameter pipe conveying water branches into two
pipes of diameter 250 mm and 200 mm respectively. If
the average velocities in the 300 mm and the 200 mm pipes
be 2.5m/sec and 1 m/sec, calculate the velocity in the
250 mm pipe.   8 M

4. a) A 150mm diameter jet moving at 25 meters per second
impinges on a series of vanes moving at 12.5 meters per
second in the direction of the jet. The jet leaves the vanes at
60^0 with the direction of motion of the vanes. Calculate
(i) the force exerted by the jet in the direction of motion of
the vanes and (ii) work done by the jet per second.   8 M

b) A jet of water delivers 0.56 m^3 /sec with a velocity of 24 metres/sec and impinges tangentially on a vane moving in the direction of the jet with a velocity of 12 metres per second. The vane is so shaped that if stationary it would deflect the jet through an angle of 45^0. Through what angle will the jet be actually deflected? What driving force will be exerted on the vane in the direction of motion?   8 M

5. a) A reaction turbine works at 460 rpm under a head of 110 metres. Its diameter at inlet is 1150 mm and the flow area is 0.03 m^2 . The angles made by the absolute velocity and relative velocity at inlet are respectively 18^0 and 50^0 with the tangential velocity. Determine (i) The volume flow rate (ii) The power developed (iii) The efficiency. Assume whirl at outlet to be zero.   8 M

   b) A turbine develops 7725 kW under a head of 28 meters at 140 rpm. Calculate the specific speed of the turbine and state the type of turbine.   8 M

6. a) Draw and discuss characteristic curves of a pump.   8 M

   b) Explain the working of reciprocating pump with neat sketch.
                                                              8 M