

Code No: 54063

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD  
B.Tech II Year II Semester Examinations, December-2014/January-2015  
MECHANICS OF FLUIDS AND HYDRAULIC MACHINES  
(Common to ME, MIE, MIM, MSNT)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Explain atmospheric, gauge and vacuum pressures with the help of sketch.
- b) A plate 0.05 mm distant from a fixed plate, moves at 120 cm/s and requires a force of 2N per unit area to maintain this speed. Determine the fluid viscosity between the plates.
2. Derive the continuity equation for three dimensional flow.
- 3.a) Find the head lost due to friction in a pipe of diameter 400 mm and length 50m through which water is flowing at a velocity of 3m/s taking  $\gamma$  of water as 0.01 stokes.
- b) Find the velocity of the flow of an oil through a pipe when the difference of mercury level in a differential U-tube manometer connected to the two tappings of the pitot tube is 100 mm. Take co-efficient of pitot-tube as 0.98 and specific gravity of oil=0.8.
4. Define displacement, momentum and energy thicknesses. Also find these thicknesses when the velocity distribution in the boundary layer is given by  $u/U=y/\delta$ , where  $u$  is the velocity at a distance  $y$  from the plate and  $u=U$  at  $y=\delta$ ,  $\delta$  being boundary layer thickness.
5. A jet of 60 mm diameter travelling with a velocity of 20 m/s strikes a plate travelling with a velocity 5 m/s in a perpendicular direction. Find the force on the plate, work done and the efficiency of the jet.
- 6.a) What are the various efficiencies of a turbine?
- b) A water turbine has a velocity of 6 m/s at the entrance to the draft tube and a velocity of 1.2 m/s at the exit. For frictional losses of 0.1 m and a tail water 5.5 m below the entrance to the draft tube, find the pressure head at the entrance.
- 7.a) Explain the terms specific speed, unit speed and unit power as applied to hydraulic turbines.
- b) A Francis turbine runner having a diameter of 2.92 m operates at 163.5 r.p.m., under 54m head and develops 19900kW at an efficiency of 87%. Find the other characteristics if this turbine is operated under 60 m head.
- 8.a) What is an indicator diagram of a reciprocating pump? Sketch the theoretical indicator diagram for a single acting reciprocating pump not fitted with an air vessel.
- b) Explain the term 'NPSH'.

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