

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad**II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2018**Subject: Mechanics of Fluids and Hydraulic Machines

Branch: ME

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions of the following

5x15M=75M

1. a) Define the terms and write their units: Specific gravity, viscosity, compressibility and specific weight [5M]
 b) A differential manometer connected at two points in a pipe flow containing an oil of specific gravity 0.8 shows a difference in mercury level as 100mm. Determine the difference in pressure at the two points [5M]
 c) Find the surface tension in a soap bubble of 30mm diameter when the inside pressure is 1.962 N/m^2 above atmosphere. (5M)
2. a) Define stream line, path line and streak line. Derive mathematical expression for each these lines. [7M]
 b) The Water is flowing through a taper pipe line having diameters 300mm and 150 mm at section 1 and 2 respectively the discharge through pipe is 40 Lit /Sec . The section 1 is 10m above and section 2 is 6m above from datum line find pressure at section 2 if section 1 is having a pressure of 400 kN/m^2 . [8M]
3. a) Derive the Darcy-Weisbach equation for friction head loss in a pipe. [5M]
 b) A horizontal Venturimeter with inlet diameter 200mm and throat diameter 100mm is used to measure flow of water. The reading of differential manometer connected at the inlet is 180mm of Mercury. If the coefficient of discharge is 0.98 then determine rate of flow [10M]
4. a) Define Laminar boundary Layer, turbulent boundary layer, laminar sub layer and boundary layer thickness (8M)
 b) Find the displacement thickness, momentum thickness and energy thickness for the velocity distribution in boundary layer by equation $u/U = y/\delta$. Also calculate the ratio of energy thickness / momentum thickness (7M)
5. a) Derive an expression for the force, workdone and efficiency of moving inclined plate/vane.
 (b) A jet of water of diameter 100mm strikes a curved plate at its centre with a velocity of 15m/s. The curved plate is moving with a velocity of 7m/s in the direction of the jet. The jet is deflected through an angle of 150° . Assuming the plate smooth. Find : (i) force exerted on the plate in the direction of the jet (ii) Power of the jet (iii) jet efficiency. [7M +8M]
6. A pelton turbine is supplied with water at the rate of 10,000 lpm under a head of 125m. The bucket deflects the jet through an angle of 160° . The speed ratio is 0.465 and the velocity coefficient is 0.982. sketch the velocity triangles and estimate the hydrodynamic force on the buckets, the power developed and the efficiency of the turbine. Allow for 10% friction loss in relative velocity due to surface roughness of the buckets. [15M]

7. a) What is specific speed? Derive an expression for specific speed in Hydraulic Turbines. Indicate significance. [8 M]
- b) A turbine develops 7357.5KW shaft power, when running at 200rpm, under a head of 40m. If the head on the turbine is reduced to 25m, determine speed power developed by the turbine. [7 M]
8. a) What is a reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch. Why is a reciprocating pump not coupled directly to the motor. Discuss the reason in detail? [7 M]
- b) A double-acting reciprocating pump, running at 50rpm, is discharging 900 litres of water per minute. The pump has stroke of 400mm. The diameter of the piston is 250mm. The delivery and suction heads are 25m and 4m respectively. Find (i) theoretical discharge (ii) slip (iii) percentage of slip (iv) power required to drive the pump. [8 M]