Semester: III
Class test: 2
Note: Attempt all questions

Subject: Fluid Mechanics and Fluid Machines PCC-ME-303/21
Time 1.5 hrs
Max Marks: 30

Q1. The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by   10   CO4

$$T = D^5 N^2 \rho \phi \left[\frac{\mu}{D^2 N \rho} \right].$$

Prove this by using Buckingham's pi-theorem.

Q.2 Define Hydraulic efficiency, Mechanical efficiency, jet ratio of Pelton turbine.   10   CO5
A 137 mm diameter jet of water issuing from a nozzle impinges on the buckets of a Pelton wheel and the jet is deflected through an angle of 165° by the buckets. The head available at the nozzle is 400 m. Assuming co-efficient of velocity as 0.97, speed ratio as 0.46, and reduction in relative velocity while passing through buckets as 15%,
find : (i) The force exerted by the jet on buckets in tangential direction, (ii) The power developed.

Q 3 The cylinder bore diameter of a single-acting reciprocating pump is 150 mm and its stroke is   10   CO6
300 mm. The pump runs at 50 r.p.m. and lifts water through a height of 25 m. The delivery pipe is 22 m long and 100 mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 0.0042 m³/s, find the percentage slip. Also determine the acceleration head at the beginning and middle of the delivery stroke.

OR

Draw and discuss the Main Characteristic Curves and operating characteristics of a centrifugal pump.