CT-4 on ME 223 (IPE) Date: 28/07/2021

Student Name: _____ Student ID: _____

1. The following data were collected from a Pelton turbine:
   Head at the base of the nozzle = 200 m, Discharge from the nozzle = 0.5 m^3/s
   Area of the jet = 8300 mm^2, Power available at the shaft = 820 kW
   Mechanical efficiency = 93%
   (a) Calculate the power loss
      (i) in the nozzle,
      (ii) in the runner (including the energy of discharge from buckets), and
      (iii) in mechanical friction and windage.
   (b) Calculate (i) nozzle efficiency,
      (ii) wheel efficiency, and
      (iii) overall efficiency.

2. A double-jet Pelton wheel has specific speed of 26 and is required to deliver 10 MW of power at the shaft. The turbine is supplied through a pipeline from a reservoir whose level is 400 m above the nozzles. Allowing 5% for friction loss in the pipe, calculate: (a) speed in rpm,
   (b) diameter of the jets and
   (c) pitch diameter of the wheel,
   Assume $\varphi = 0.46$, $C_v = 0.98$ and $\eta_0 = 0.85$