1.3

Name of the Program: B. Sc. in Mechanical Engineering/B.Sc. TE
Semester:6th (Summer)

Date: 06 March, 2024
Time: 10:00 am – 11:30 am

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid Semester Examination
Course Number: ME 4611
Course Title: Fluid Machinery

Summer Semester : 2022 - 2023
Full Marks: 75
Time : 1.5 Hours

There are **03 (Three)** questions. Answer **all** questions. The symbols have their usual meanings.

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1. At the power station, a Pelton wheel produces 1260 kW under a head of 610 m. The loss of head due to pipe friction between the reservoir and nozzle is 46 m. The buckets of the Pelton wheel deflect the jet through an angle of 165^0, while relative velocity of the water is reduced by 10% due to bucket friction. The bucket/jet speed ratio is 0.46. The bucket circle diameter of the wheel is 890 mm and there are two jets. Find the theoretical hydraulic efficiency, speed of rotation of the wheel, and diameter of the nozzle if the actual hydraulic efficiency is 0.9 times that calculated above. Assume nozzle velocity coefficient, $C_v = 0.98$. **(25) CO3, PO4 K8, P1**

2. The following design data apply to an inward flow radial turbine: **(25) CO4, PO3 K5, P1**
Overall efficiency = 75%
Net head across the turbine = 6m
Power output = 128kW
The runner tangential velocity = 10.6 m/s
Flow velocity = 4m/s
Runner rotational speed = 235 rpm
Hydraulic losses = 18% of energy available
Calculate the inlet guide vane angle, the inlet angle of the runner vane, the runner diameter at inlet, and height of the runner at inlet. Assume that the discharge is radial.

3. Explain characteristics of Francis turbine with simple sketch and corresponding velocity diagram? Find an expression of hydraulic efficiency of a Francis turbine. **(25) CO2, PO2 K3, P1**