

B.Tech (ME) 5th Semester(G-Scheme)

Examination, November-2023

**FLUID MACHINES**

**Paper-PCC-ME-309-G**

*Time allowed : 3 hours]*

*[Maximum marks : 75*

*Note : Attempt five questions in all selecting one question from each unit. Question no. 1 is compulsory. All questions carry equal marks.*

1. (a) State impulse - momentum principle.
- (b) What difference between impulse & reaction turbine ?
- (c) What is priming ? Why it is necessary ?
- (d) What is NPSH and draw its expression ?
- (e) Hydraulic intensifier
- (f) Purposes of Draft tube 6×2.5=15

**Unit-I**

2. (a) Derive an expression for force exerted by a jet of water on an inclined fixed plate in the direction of the jet.

- (b) A nozzle of 50mm diameter deliver a stream of water at 20m/s perpendicular to the plate that moves away from the jet at 5m/s. Find the force on plate, work done and efficiency of jet.

5+10=15

3. (a) Derive an expression for efficiency and maximum efficiency of Pelton turbine.

- (b) A Pelton wheel is required to develop 6MW power when working under a head of 300m. It rotates at a speed of 600rpm. If jet ratio is 10 and overall efficiency is 85%, then determine. diameter of wheel, quantity of water required and number of jets.

5+10=15

### Unit-II

4. Explain the component parts, construction and operation of modern Francis turbine with detailed sketch.

15

5. In a tidal power plant, bulb turbine (which is basically an axial flow turbine) operates a 5MW generator at 150 rpm, under a head of 5.5m the generator efficiency is 93% and overall efficiency of turbine is 88%. The

tip diameter of runner is 4.5 m and hub diameter is 2m. Assuming hydraulic efficiency of 94% and no exit whirl, determine the runner vane angles at inlet and exit at the mean diameter of the vanes. 15

### Unit-III

6. Derive an expression for minimum speed required for starting a centrifugal pump. Define the term specific speed of a centrifugal pump and deduce an expression for it in terms of the Head  $H$ , Discharge  $Q$ , and the Speed  $N$ . 15
7. The pressure difference  $\Delta p$  in a pipe of diameter  $D$  and length  $L$  due to turbulent flow depends on the velocity  $V$ , viscosity  $\mu$ , density  $\rho$  and roughness  $k$ . Using Buckingham's  $\pi$ -theorem, obtain an expression for  $\Delta p$ . 15

### Unit-IV

8. Write an expression for discharge, work done and power required to drive a double acting reciprocating pump. Also explain the effect of acceleration on suction and discharge pipes in case of reciprocating pump. 15

9. Write short notes on :

5+5+5=15

- (a) Torque converter
- (b) Fluid coupling
- (c) Hydraulic accumulator