

**D-180578****B. Tech. EXAMINATION, 2018**

Semester IV (CBS)

**TURBO MACHINES**

ME-404

Time : 3 Hours

Maximum Marks : 60

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt one question from each Section. Q. No. 9 is compulsory.

**Unit I**

A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at  $45^\circ$  to the axis of the jet. Find the normal pressure on the plate : (a) when the plate is stationary, (b) when the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving.

10

2. The penstock supplies water from a reservoir to the pelton wheel with a gross head of 500 m. One-third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is  $2.0 \text{ m}^3/\text{s}$ . The angle of deflection of the jet is  $165^\circ$ . Determine the power given by the water to the runner and also hydraulic efficiency of the pelton wheel. Take speed ratio = 0.45 and  $C_v = 1.0$ .

10

**Unit II**

3. (a) Differentiate between radial mixed and axial flow reaction turbine.  
(b) Explain performance characteristic curves of reaction turbine.
4. (a) What is draft tube ? What are its functions ?  
(b) What is cavitation ? How can it be avoided in reaction turbine ?

10

10

**Unit III**

5. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of  $40^\circ$  at

out let. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine Vane angle at inlet, Work done by impeller on the water per second and Manometric efficiency. 10

6. A single acting reciprocating pump running at 50 rpm delivers  $0.01 \text{ m}^3/\text{s}$  of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine the theoretical discharge of the pump, coefficient of discharge and slip percentage of the pump. 10

#### Unit IV

7. Explain various slip factors H-S diagram for centrifugal compressor. 10
8. Discuss free and forced vortex flow performance. 10
9. Explain the following terms : 4×5=20
- (i) Centrifugal Vs. Reciprocating pumps
  - (ii) Degree of reaction
  - (iii) Safe height of installation for the turbine
  - (iv) Components of Pelton Wheel
  - (v) Types of hydro turbines.