Section D

7. Explain with a neat sketch the construction and principle of operation of centrifugal compressor. Also, explain surging and chocking in centrifugal compressor. **15**

8. Explain velocity triangle, degree of reaction, efficiency and work done factor for axial flow compressor. **15**

9. Briefly explain the following : **10×1.5=15**

   (a) Gross Head

   (b) Advantages of reciprocating pump over centrifugal pumps

   (c) Volumetric efficiency

   (d) Use of air vessels

   (e) Thomas cavitation parameter

   (f) Function of draft tube

   (g) Net Positive Suction Head

   (h) Components of Pelton Wheel

   (i) Specific speed

   (j) Resonance in reciprocating pumps.

MAR-21-210053

B. Tech. EXAMINATION, March 2021

Semester IV (CBCS)

TURBO MACHINES

ME-404

Time : 2 Hours   *Maximum Marks : 60*

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. The Pelton type of impulse turbines are in operation in a power house where each turbine delivers a maximum horsepower of 19,300 while working under a head of 855 m and running at 600 rpm. Find the

least diameter of the jet and mean diameter of the wheel. What would be the approximate diameter of orifice of the nozzle tip ? Determine the value of jet ratio. Also, specify the number of buckets for the wheel. Take overall efficiency of the turbine as 89.2%.

15

2. A circular water jet 5.5 cm in diameter moves with a velocity of 30 m/s and strikes tangentially on a curved plate. The angle of curvature of the plate at outlet is 120° with the X-direction. Find the force exerted by the jet on the plate in X-direction (i) when the plate is stationary (ii) when the plate is moving with velocity of 12 m/sec in the direction of the jet.

15

Section B

3. The inner and outer wheel diameter of an inward flow reaction turbine is 0.5 m and 1.0 m respectively. The vanes are radial at inlet and the discharge is radial at outlet and the water enters the vane at an angle of 10°. Find the speed of the wheel and vane angle at the outlet while assuming a constant velocity of flow equal to 3 m/s.

15

4. (a) Explain the function of draft tube in reaction turbines. **7.5**

   (b) What is cavitation ? How does it affect the performance of hydraulic machines ? **7.5**

Section C

5. A diffusion type centrifugal pump has a suction lift of 1.5 m and the delivery tank is 11.5 m above the pump. The velocity of water in the delivery pipe is 1.5 m/s. The radial velocity of flow through the wheel is 3 m/s and the tangent to the vane at exit from the wheel makes an angle of 120° with the direction of motion. Find (a) velocity of the wheel at exit (b) pressure and velocity head at exit from the wheel; assuming that the water enters radially and neglecting friction and other losses. **15**

6. A single acting reciprocating water pump of 18 cm bore and 24 cm stroke is operating at 40 rpm. Determine its discharge if the slip is 8%. What is the value of coefficient of discharge ? If the suction and delivery heads are 6 m and 20 m respectively, determine the theoretical power. Also, what is the power requirement if overall efficiency is 80%. **15**