Section C

5. (a) Why are Centrifugal pumps used sometimes in series and sometimes in parallel ? Draw the following characteristics curves for a centrifugal pump : Head, power and efficiency *versus* discharge with constant speed. **10**

   (b) What is priming ? Why is it necessary ? **5**

6. What is a reciprocating pump ? Describe the principle and working of a reciprocating pump with a neat and clean sketch. Why is a reciprocating pump not coupled directly to motor ? Discuss the reason in detail. **15**

Section D

7. (a) What is a centrifugal compressor ? Describe the principle and working of a centrifugal compressor with a neat and clean sketch. **10**

   (b) What is the meaning of degree of reaction ? **5**

8. Explain the difference between fans, blowers and compressors in the both cases: centrifugal flow and axial flow. **15**

Sep-21-00053

B.Tech. EXAMINATION, 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 any of the Sections A, B, C and D. Q. No. **9** is compulsory. Assume any suitable missing data if any. Use of non-programmable calculator is allowed.

Section A

1. (a) Water is flowing through a pipe at the end of which a nozzle is fitted. The diameter of the

nozzle is 95 mm and the head of water at the centre of nozzle is 95 m. Find the force exerted by the jet of water on a fixed vertical plate. The coefficient of velocity is given as 0.95. **5**

(b) What do you mean by gross head, net head and efficiency of turbine ? Explain the different types of the efficiency of a turbine. **10**

2. (a) The following data is related to a Pelton wheel :

Head at the base of the nozzle = 80 m, Diameter of the jet = 100 mm, Discharge of the nozzle = 0.30 m³/s, Power at the shaft = 206 kW, Power absorbed in mechanical resistance = 4.5 kW. Determine :

(i) Power lost in nozzle **5**

(ii) Power lost due to hydraulic resistance in the runner. **5**

(b) Draw the schematic diagram of Pelton Turbine.

5

Section B

3. (a) A Francis turbine working under a head of 30 m has a wheel diameter of 1.2 m at the entrance and 0.6 m at the exit. The vane angle at the entrance is 90° and guide blade angle is 15°. The water at the exit leaves the vanes without any tangential velocity and velocity of flow in the runner is constant. Neglecting the effect of draft tube and losses in the guide and runner passages, determine the speed of wheel in r.p.m and vane angle at the exit. **10**

(b) Define the terms: speed ratio, flow ratio and jet ratio. **5**

4. (a) Give the range of specific speed values of the Kaplan, Francis and Pelton turbines. What factors decide whether Kaplan, Francis or a Pelton type turbine would be used in a hydroelectric project ? **7½**

(b) Define the term Governing of a turbine. Draw a neat and clean sketch of oil pressure governor. **7½**

Section E

(Compulsory Question)

9. (a) How will you prevent the cavitation in hydraulic machines ?

(b) What is the significance of similarity parameters in hydraulic pumps ?

(c) What is negative slip in a reciprocating pump ?

(d) Why is it that the speed of a reciprocating pump without air vessels is not high ?

(e) What is the basis of selection of turbine at particular place ?

(f) Define the following terms: Impact of jets and Specific speed.

(g) Write down the equation for lift, drag forces acting on a turbine blades ?

(h) What is the special feature of Kaplan turbine ?

(i) What is slip factor ?

(j) What do you understand by Stalling and Surging ?   1½×10=15