(Compulsory Question)

9. Short answer type questions (Attempt any *five*) :

(a) Differentiate between the radial and axial flow turbines.

(b) Define and explain hydraulic efficiency and mechanical efficiency.

(c) Governing of turbine

(d) Working of airlift pump

(e) Applications of indicator diagram

(f) Derive the expression for work done

(g) Parameters required for selection of turbine.

3×5=15

Roll No. ..... **Total Pages : 04**

J-21-0077

B. Tech. EXAMINATION, 2021

Semester VI (CBCS)

HYDRAULIC MACHINES

CE-609

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.

Section A

1. A water jet 20 mm in diameter and having a velocity of 90 m/s strikes series of moving blades in a wheel. The direction of the jet makes 20° with the direction of movement of the blade. The blade angle at inlet is

35°. If the jet should enter the blade without striking, what should be the blade velocity ? If the outlet angle of the blade is 30°, determine the force on the blade. Assume that there is no friction involved in the flow over the blade. **15**

2. Francis turbine working under a head of 5 m at a speed of 210 rpm develops 75 kW when the rate of flow of water is 1.8 m^3/sec. If the head is increased to 16 m, determine the speed, discharge and power. **15**

Section B

3. Explain the working of a single stage centrifugal pump with neat sketches along with applications. **15**

4. Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes at the centre of the semi-circular plate is two times the force exerted by the jet on an fixed vertical plate. **15**

Section C

5. (a) Differentiate between rotary and vacuum pumps with neat and clear diagrams. **7.5**

(b) Discuss the working and function of draft tube with neat diagram. **7.5**

6. Explain the construction, working and principle of Reciprocating pump with neat and clean diagram along with mertis, demerits and applications. **15**

Section D

7. Two jets strike at bucket of a Pelton wheel, which is having shaft power as 14,715 kW. The diameter of each jet is given as 150 mm. If the net head on the turbine is 500 m, find the overall efficiency of the turbine. Take C_v = 1.0. **15**

8. The diameter and width of a centrifugal pump impeller are 50 cm and 2.5 cm. The pump runs at 1200 rpm. The suction head is 6 m and the delivery head is 40 m. The frictional drop in suction is 2 m and in the delivery 8 m. The blade angle at out let is 30°. The manometric efficiency is 80% and the overall efficiency is 75%. Determine the power required to drive the pump. Also calculate the pressure at the suction and delivery side of the pump. **15**