JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech- VI Semester (CE)

COURSE CODE(CREDITS): 18B1WCE 639 (3) MAX. MARKS: 35

COURSE NAME: Open channel flow and Hydraulic Machine

COURSE INSTRUCTORS: Ashish Kumar MAX. TIME: 2 Hours

Note: (a)All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. **(a)** What is reciprocating pump? Describe the principle and working of the pump with neat sketch. **[5]**

Q2. **(a)** Define the terms unit power, unit speed and unit discharge with reference to a hydraulic turbine. **[2]**

(b) A turbine develops 9000 kW when running at 100 rpm. The head on the turbine is 30 m. if head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine. **[2]**

Q3. **(a)** Differentiate between Kaplan and propellor turbine. **[1]**

(b) The hub diameter of a Kaplan turbine, working under a head of 12 m, is 0.35 times the diameter of the runner. The turbine is running at 100 rpm. If the vane angle of extreme edge of the turbine at outlet is 15° and the flow ratio is 0.6 find,

(a) Diameter of the runner
(b) Diameter of the boss
(c) Discharge through the runner

Q4 A single-acting reciprocating pump running at 50 rpm delivers 0.01 m3 /sec. The diameter of piston is 200 mm and pump has a stroke of 400 mm. Determine: Theoretical discharge, coefficient of discharge, slip of the pump. **[4]**

Q5. **(a)** What is a draft tube? Why is it used in a reaction turbine? describe with neat sketches different types of draft tubes. **[3]**

(b) A conical draft tube has a velocity of 6 m/s at the entrance of the draft tube and a velocity of 1.2 m/s at the exit. For frictional losses of o.1 m and a tailwater 5 m below the entrance to the draft tube, find the pressure head at the entrance. **[3]**

Q6. **(a)** Differentiate between inward flow and outward flow reaction turbine. **[4]**

(b) An inward flow reaction turbine has external and internal diameters as 0.9 m and 0.45 m respectively. The turbine is running at 200 rpm and width of turbine at inlet is 200 mm. The velocity of flow through the runner is constant and equal to 1.8m/s. The guide blade angle (α) at inlet is 10° and discharge at outlet is radial (β= 90°). **[1]**

Draw the inlet and outlet velocity triangle and determine: **[10]**

(i) The absolute velocity of water at the inlet of runner
(ii) The velocity of whirl at inlet
(iii) Relative velocity at inlet
(iv) The runner vane angles at the inlet and outlet
(v) Width of the runner at the outlet
(vi) Mass of water flowing through the runner per second
(vii) Power developed
(viii) Hydraulic efficiency