2005-PUNJAB UNIVERSITY

B.TECH DEGREE EXAMINATION

FLUID MACHINERY

TIME-3HOUR
MARKS-100

PART A[10*2=20 MARKS]

1. Define the terms Gross head and Net or Effective head.

2. List the advantages of Kaplan turbine over Francis turbine.

3. List down the functions of a draft tube.

4. What is meant by scale effect?

5. List down some advantages of centrifugal pumps over displacement pumps.

6. What do you understand by specific speed of a centrifugal pump?

7. Explain the term negative slip as referred to reciprocating pumps.

8. List down the functions of air vessels.

9. Differentiate between hydraulic accumulator and hydraulic intensifier.

10. Define the term Net Positive Suction Head.

PART B[10*8=80 MARKS]

2. A jet strikes tangentially a smooth curved vane moving in the same direction as the jet, and the jet gets reversed in the direction. Show that the maximum efficiency is slightly less than 60 percent.

3. Obtain an expression for the specific speed of a hydraulic turbine and explain in brief its significance.

4. The following data relate to a Pelton wheel:
Head = 72 m, speed of wheel = 240 r.p.m., shaft power of the wheel = 115 kW, speed ratio = 0.45, coefficient of velocity = 0.98, overall efficiency = 85%. Design the Pelton wheel.

5. A reaction turbine works at 450 r.p.m. under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is 0.4 m2. The angles made by absolute and relative velocities at inlet are 20o and 60o respectively with the tangential velocity. Determine:

(a) the volume flow rate

(b) the power developed, and

(c) the hydraulic efficiency.

6. A centrifugal pump rotating at 1500 r.p.m. delivers 0.2 m3/s at a head of 15 m. Calculate the specific speed of the pump and the power input. Assume overall efficiency of the pump is 0.68. If this pump were to operate at 900 r.p.m., what would be the head, discharge and power required for homologus conditions? Assume overall efficiency remains unchanged at new r.p.m.

7. Explain with neat sketch, the construction and working of an air lift pump. Mention its advantages.

8. (a) Show from the first principles that work saved in a single-acting reciprocation pump, by fitting an air vessel is 84.8 per cent.

(b) A single acting reciprocating pump operating at 120 r.p.m. has a piston diameter of 200 mm and stroke of 300 mm. The suction and delivery heads are 4 m and 20 m respectively. If the efficiency of both suction and delivery stroke is 75 per cent, determine the power required by the pump.

9. (a) What is cavitation? How can it be avoided in reaction turbines?

(b) A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30 o with the direction of motion of vane at inlet and leaves at an angle of 90o to the direction of motion of vane at outlet. Determine the vane angles at inlet and outlet so that the water enters and eaves the vane without shock.