(b) What is negative slip reciprocating pump ? Explain with neat sketches the function of air vessels in a reciprocating pump. 10

9. (a) Determine the length of stroke for an accumulator having a displacement of 115 litres. The diameter of the plunger is 350 mm. 10

(b) A hydraulic press has a ram of 300 mm diameter and a plunger of 50 mm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 40 N. 10

Roll No. .....

24259

B. Tech. 5th Semester (ME)

Examination – December, 2016

FLUID MACHINE

Paper : ME-305-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the question, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question no. 1 is ***compulsory***. Attempt ***five*** questions in total by selecting at least ***one*** question from each Section.

1. Discuss about following : 4 × 5 = 20

(a) Weber's number

(b) Cavitation in pumps

(c) Hydraulic crane

(d) Specific speed of turbine

SECTION – A

2. (a) A jet of water of 30mm diameter, moving with a velocity of 15m/s, strikes a hinged square plate

of weight 245.25 N at the centre of the plate. The plate is of uniform thickness. Find the angle through which the plate will swing. 10

(b) Find the force exerted by a jet of water of diameter 70mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20 m/s. 10

3. (a) Design a pelton wheel for a head of 80m and speed 300 rpm. The pelton wheel develops 103kW S.P. Take Cv, = 0.98, speed ratio = 0.45 and overall efficiency = 0.80. 10

(b) Derive an expression for work done and efficiency of pelton wheel turbine. 10

SECTION – B

4. A reaction turbine works at 500 rpm under a head of 100 m. The diameter of the turbine at inlet is 100 cm and flow area is 0.35 m^2. The angles made by relative and absolute velocities at inlet are 60° and 15° respectively with the tangential velocity. Assume whirl at outlet to be zero. Determine (i) the volume flow rate, (ii) the power developed, (iii) efficiency. 10

5. (a) Differentiate between Kaplan and propeller turbine. 10

(b) A Kaplan turbine runner is to be designed to develop 7357.5 kW shaft power. The net available head is 10 m. Assume that the speed ratio is 1.8

and flow ratio 0.6. If the overall efficiency is 70% and diameter of the boss is 0.4 times the diameter of the runner, find the diameter of the runner, its speed and specific speed. 10

SECTION – C

6. (a) Show that ratio of inertia force to viscous force give the Reynold's number. 10

(b) In 1 : 3 model of a spillway, the velocity and discharge are 1.5 m/s and 2.0 m^3/s. Find the corresponding velocity and discharge in the prototype. 10

7. (a) How does a volute casing differ from a vortex casing for the centrifugal pump ? 10

(b) Find the number of pumps required to take water from a deep well under a total head of 156 m. Also the pumps are identical and are running at 1000 rpm. The specific speed of each pump is given as 20 while the rated capacity of each pump is 150 litre/s. 10

SECTION – D

8. (a) Find an expression for the head lost due to friction in suction and delivery pipes of reciprocating pump. 10