(Following Paper ID and Roll No. to be filled in your Answer Books)										
PAPER ID :	Roll No.									

B.TECH.

Theory Examination (Semester-IV) 2015-16

FLUID MACHINERY

Time : 3 Hours *Max. Marks : 100*

SECTION A

1 Attempt all question **(2*10=20)**

a) Explain the steps involved in the computation of work done by a jet. Of velocity V when it impinges as a single curved vane at a velocity of v in the direction of jet and deflects the water by an angle θ.
b) What are repeating variables and how are they selected?
c) Compare impulse turbine with reaction turbine.
d) What is Draft tube?
e) Define manometric head and what are the ways it is expressed?
f) List the factors which are contributing the cavitation in centrifugal pumps.
g) What is meant by specific speed for pump?
h) What is a Surge tank?
i) Define the terms Dimensional analysis and Model analysis.
j) List out components used in Hydroelectric power plant

SECTION B

2.Attempt any five **(5*10=50)**

a) Design a Pelton used for a head of 120 m and speed 300 r.p.m. The Pelton which develops 145 kW. Assume $C_v = 0.98$, speed ratio = 0.45 and overall efficiency = 80 %.
b) A turbine is to operate under a head of 30 m at 300 r.p.m. with a discharge of 30 m^3/s. If the efficiency is 90 %, determine specific speed of turbine, power generated and the type of turbine.
c) A centrifugal pump having an external and internal diameter of 1.25 m and 0. 5 m respectively is discharging water at a rate of 2000 litres/second against the head of 16 m when running at 300 rpm. The vanes are curved back at an angle of 30° with tangent at outlet and velocity of flow is constant at 2.5 m/s.
Find:
i. Efficiency of pump
ii. Power required.
d) Describe with neat sketches the working of
i. Hydraulic Ram.
ii. Hydraulic Intensifier.
e) In an inward radial flow turbine, water enters at an angle of 22° to the wheel tangent to the outer rim and leaves at 3 m/s. The flow velocity is constant through the runner. The inner and outer diameters are 300 mm and 600 mm respectively. The speed of the runner is 300 mm. The discharge through the runner is radial. Find :
i. Inlet and outlet blade angles
ii. Taking inlet width as 150 mm and neglecting the thickness of the blades
iii. The power developed by the turbine
f) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. Hence derive an expression for maximum efficiency of the Pelton wheel giving the relationship between the jet speed and bucket speed

g) Calculate the work saved by fitting an air vessel for a double acting single cylinder reciprocation pump.

h) Find the power required to drive a centrifugal pump which to drive a centrifugal pump which delivers 0.04 m^3 /s of water to a height of 20 m through a 15 cm diameter pipe and 100 m long. The overall efficiency of the pump is 70% and coefficient of friction is 0.15 in the formula $h_f=4flv^2/2gd$.

SECTION C

Attempt any two **(2*15=30)**

3. Draw a neat sketch of Reciprocating pump and explain the working principle of single acing and double acting Reciprocating pump.
4. A Francis turbine has an inlet diameter of 2.0 m and an outlet diameter of 1.2m. The width of the blades is constant at 0.2 m. The runner rotates at a speed of 250 rpm with a discharge of 8 m^3/s .The vanes are radial at the inlet and the discharge is radially outwards at the outlet. Calculate the angle of guide vane at inlet and blade angle at the outlet.
5. A centrifugal pump is to discharge 0.2 m^3/s of water at a speed of 1480 r.p.m. against a head of 22 m. The impeller diameter is 50 mm, its width at outlet is 50 mm and the manometric Efficiency is 76 %. Determine the vane angle at the outer periphery of the impeller