# [03 – 4117]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Mechanical Engineering

FLUID MACHINERY AND SYSTEMS

(W.e.f. admitted batch of 2006 – 2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer question ONE and any FOUR from the rest.

All questions carry equal marks.

Answer to question No. 1 must be at one place.

1. (a) Define the terms:
   (i) Impact of jets
   (ii) Jet propulstions.
   (b) Differentiate between turbines and pumps.
   (c) Give the classification of turbines.
   (d) Define cavitation. What are the effects of cavitation?
   (e) Differentiate between single acting and double acting reciprocating pump.

(f) Define percentage of stop and negative slip in reciprocating pumps.

(g) Define the term Hydraulic devices, name any three hydraulic devices.

2. A rectangular plate weighting 58.86N is suspended vertically by a hinge on the top horizontal edge. The center of gravity of the plate is 10cm from the hinge. A horizontal jet of water 2cm diameter, whose axis is 15cm below the hinge impinges normally on the plate with a velocity of 5 m/s. find the horizontal force applied at the center of gravity to maintain the plate in its vertical position. Find the corresponding velocity of jet, of the plate is deflected through 30° and the same force continuous to act at the center of gravity of the plate.

3. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity is 20 m/s. The jet makes an angle of 30° to the direction of motion of vanes when entering and leaves at an angle of 120°. Draw the triangles of velocity at inlet and outlet and find

(a) The angle of vanes tips so that water enters and leaves without shocks

(b) The work done per unit weight of water entering the vanes.

(c) Efficiency.

4. (a) Explain the differences between Kaplan turbine and propellar turbine.

(b) The following data is related to pelton whell.

Head at the base of the nozzle = 80m

Diameter of the jet = 100mm

Discharge of the nozzle = $0.3m^3/s$

Power of the shaft = 206 kw.

Power absorbed in mechanical resistance = 4.5 kw.

Determine

(i) Power lost in nozzle

(ii) Power lost that due to hydraulic resistance in the runner.

5. (a) Explain main characteristic curves of a hydraulic turbine.

(b) A turbine develops 9000 kw when running at 500 rpm. The head on the turbine is 30m. If the head on the turbine is reduced to 18m, determine the speed and power developed by the turbine.

6. A centrifugal pump discharges $0.15m^3/s$ of water against a head of 12.5m, the speed of the impeller being 600 rpm. The outer and inner diameter of rupellar are 500mm and 250mm respectively and the vanes are bent back at 35° to the tanget at

exit. If the area of flow remains $0.07m^2$ from inlet to outlet. Calculate

(a) Manometric efficiency

(b) Vane angle at inlet

(c) Loss of head at inlet to impeller when the discharge is reduced by 40%. With out changing the speed.

7. (a) Classify the reciprocating pumps.

(b) A double acting reciprocating pump, rumney at 40 rpm is discharging $1.0m^3$ of water per minutes. The pump has a stroke of 400 mm. The diameter of the piston is 200 mm. The delivery and suction heads are 20m and 5m respectively. Find the slip of the pump required to drive the pump.

8. (a) Explain with a neat sketch the working principle of hydraulic intensifier.

(b) The water is supplied at the rate of $0.02m^3$/second from a height of 3m to a hydraulic ram, which raises $0.002m^3/s$ to a height of 20m. From the ram. Determine D' Aubuission's and Rankine's efficiencies of the hydraulic ram.

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