Roll No. | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–6)

FLUID MACHINERY

Subject Code :BTME-603

Paper ID : [A2363]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Q1 Answer briefly :

a) Define the terms Euler's head, and degree of reaction.

b) What is the function of Braking jet?

c) Differentiate between Kaplan and Propeller turbine.

d) What is the function of a draft tube in hydraulic turbine?

e) Define specific speed of pump and write its expression.

f) Define slip in relation to pumps.

g) What is the need for priming of a pump?

h) Define utility of Surge shaft.

i) Define Net Positive Suction Head (NPSH) and write its expression.

j) Why Air lift pumps have been phased out?

SECTION-B

Q2 State "*Impulse momentum equation*", also give its applications. Why the case of jet striking single moving vane is not feasible?

Q3 Derive an expression for efficiency and maximum efficiency of Francis Turbine.

Q4 A single acting reciprocating pump of 20cm bore and 30cm stroke handles water. The suction pipe diameter and length are 12 cm and 8m respectively. The delivery pipe diameter and length 12cm and 24m respectively. The speed of operation is 32 *rpm:* Determine friction power with or without air vessels. Take Darcy's friction factor, f, as 0.02.

Q5 Derive expressions for model relationships in case of centrifugal pump.

Q6 With the help of neat diagram, explain the working principle of fluid coupling. Also, describe the slip and the efficiency of the fluid coupling.

SECTION-C

Q7 The impeller of a centrifugal pump has an outer diameter of 25 cm and an effective outlet area of 170 cm^2. The blades are backward curved and direction of relative velocity at outlet makes an angle of 148° with the direction of vane motion. The diameters of suction and delivery pipes are 15 cm and 10 cm respectively. The pump delivers 1860 liter/min. at 1450 *r.p.m.* The gauges attached at suction and delivery pipes close to the pump inlet and outlet show heads of 4.6 m below and 18.0 m above atmospheric pressure respectively. The head losses in the suction and delivery pipes are 2.0 m and 2.9 m respectively. The motor driving the pump supplies 8.67 KW. Find the manometeric efficiency assuming that water enters the pump without shock and whirl. Also, find the overall efficiency of the pump.

Q8 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 has a plunger diameter of 75 mm and stroke length 150 mm. It takes supply of water from a sump 3 m below the pump through a pipe 5m long and 40 mm diameter. It delivers water to a tank 12 m above the pump through a pipe 30 mm diameter and 15m long. If the separation takes place at 75KN/m^2 below atmospheric pressure, find the maximum speed at which the pump may be operated without separation, plunger operates with S.H.M.

Q9 In a Pelton Wheel the bucket deflects the jet by 170° and the relative velocity is reduced by 12% due to bucket friction. For a speed ratio of 0.47, calculate from first principle the hydraulic efficiency of the wheel. The bucket diameter of the wheel is 90cm and there is one jet for which $C_v = 0.98$. The actual efficiency of the wheel is 0.9 times its theoretical efficiency. The wheel develops 1700kW under a head of 550m. Calculate :

a) The speed of the wheel in *r.p.m.* and

b) The diameter of the nozzle.