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Total No. of Questions : 09

B.Tech.(ME) (Sem.–6)

FLUID MACHINERY

Subject Code : BTME-603

M.Code : 71187

Date of Examination : 07-07-22

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

1. Answer briefly :

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

b) What are the Guide blades in a Turbine?

c) Differentiate between Kaplan and Propeller turbine?

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

e) Define specific speed of a pump.

f) Define slip in relation to pumps?

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

h) Define utility of Surge tank.

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

j) Why Jet pumps have been phased out?

SECTION-B

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

3. Derive an expression for efficiency and maximum efficiency of Pelton turbine.

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

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

6. 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

7. 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.

8. 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.

9. A Francis Turbine supplied through a 6m penstock has the following particulars :

   Output Power = 63500KW; Flow = $117m^3/s$; Speed = 150 r.p.m. Hydraulic efficiency = 92%, mean dia. of turbine at entry = 4m; mean blade height at entry = 1m; entry diameter of draft tube = 4.2m; velocity in tail race = 2.4m/s. The static pressure head in penstock measured just before entry to runner is 57.4m. The point of measurement is 3m above level of tail race and flow leaves the runner without swirl. Determine : (a) overall efficiency, (b) direction of flow relative to runner at inlet, (c) pressure head at entry to draft tube.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.