Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

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

1. Write briefly :

(a) Define impulse momentum equation.

(b) What is the Function spear in Pelton turbine?

(c) State applications of Kaplan turbine.

(d) Define Pascal's law.

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

(f) Define slip in relation to pumps.

(g) What are positive displacement pumps?

(h) Define utility of Surge tank.

(i) How can Cavitation be prevented in turbines?

(j) Why Jet pumps have been phased out?

SECTION-B

2. Derive Euler's equation for energy conversion through hydrodynamic rotor.

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

4. Explain the function of draft tube with a neat sketch. Define its efficiency. What is the maximum limit of total angle of divergence of draft tube and why? Why is the draft tube not used with Pelton turbine?

5. Test on a pump model indicate a cavitation parameter $\sigma_c = 0.10$. A homologous unit is to installed at a location where atmospheric pressure =0.91 bar and vapour pressure = 0.035 bar absolute and is to pump water against a head of 25m. What is the maximum permissible suction head?

6. Explain with neat sketch the construction and working of a Hydraulic ram.

SECTION-C

7. A centrifugal pump impeller having outer and inner diameters of 480mm and 240mm respectively is running at 100 *r.p.m*. The rate of flow through pump is $0.0576 m^3/s$ and velocity of flow is constant and equal to 2.4m/s. The diameters of the suction and delivery pipes are 180mm and 120mm respectively and suction and delivery heads are 6.2m(abs.) and 30.2m of water respectively. If the power required to drive the pump is 23.3kW and outlet vane angle is 45°, determine :

   i) inlet vane angle

   ii) the overall efficiency

   iii) manometric efficiency

8. What is negative slip in Reciprocating pump? Explain with sketches the function of an air vessel in a reciprocating pump.

9. A Francis turbine supplied through a 6m diameter penstock has following specifications : output of installation = 63500kW, Flow = 117 m^3/s, speed 150 *r.p.m.*, hydraulic efficiency = 92%, mean diameter 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 the penstock measured just before entry to runner is 57.4 m, the point of measurement is 3m above tail race level. The loss in draft tube is equivalent to 30% of the velocity head at entry to it. The exit plane of the runner is 2m above tail race level, and flow leaves the runner without swirl. Determine :

   i) overall efficiency

   ii) direction of flow relative to runner shaft

   iii) pressure head at entry to draft tube.