SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | |

Total number of pages:[2]
Total number of questions: 09

B.Tech. || ME || 6th Sem

Fluid Machinery

Subject Code: ME- 306

Paper ID: (for office use)

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **Section A is compulsory.**
- **Attempt any four questions from section B**
- **Attempt any two questions from section C**
- **Assume any missing data, if necessary.**

PART A (2marks ×10)

Q. 1. Short answer questions:

(a) What is difference between a hydraulic turbine and a centrifugal pump?
(b) How will you calculate the force extorted by a jet striking to the inclined plate?
(c) What is function of a surge tank?
(d) Why the blades of the pelton turbine are double cupped shape.
(e) What do you mean by cavitation.How it can be avoided.
(f) What is scale effect?
(g) How energy conversion depends upon the vane shape in a centrifugal pump.
(h) What do you mean by priming? Why it is necessary.
(i) What is function of air vessel?
(j) What is difference between function of fluid coupling and torque converter?

PART B (5marks ×4)

Q. 2. What is Euler equation for energy transfer as applied to hydrodynamic machines? Derive the expression for Euler equation in terms of various energies in these machines.

Q. 3. What are various types of draft tube in a turbine? Explain its functions and analyze how it is useful for energy conversion in a reaction turbine.

Q. 4. Why the blades of Kaplan turbine are adjustable. A Kaplan turbine working under a head of 20 m develops 15 MW brake power. The hub diameter and runner diameter of the turbine are 1.5 m and 4m respectively. The guide blade angle at the inlet is 30°. The hydraulic and overall efficiencies are 90% and 80%. The discharge is radial. Work out:

i) runner vane angles and
ii) Turbine speed.

Q. 5. What do you mean by term slip in a reciprocating pump? The diameter and stroke of a single acting reciprocating pump are 15 cm and 30 cm respectively. The pump lifts water through a head of 15 m above the centre of pump when running at 40

rpm. The diameter of delivery pipe are 10 cm and 25m.The position of air vessel to the delivery side from the centre of pump is 2 m. Find the total pressure in the cylinder:

i) at the starting of delivery stroke
ii) middle of delivery stroke.

Q. 6. What do you mean by model testing and geometrical similarity? A model 1/5 of prototype is tested in a laboratory at 1200 rpm. It is observed during testing that it has developed 10 m head when power input was 40 kW. If the prototype has to work against the head of 40 m, find out:

i) speed
ii) power required to run the pump
iii) ratio of flow rates of model and prototype.

PART C (10marks ×2)

Q. 7. How will you differentiate impulse turbine from a reaction turbine. A single jet Pelton turbine is supplied from a dam 300 mm above the centre of nozzle. The diameter of pipe supplying the water is 70 cm and 5.6 km long. The friction coefficient of pipe is 0.0075. The jet diameter is 10 cm. Cv = 0.9, u/V =0.47. The outlet vane angle is 15°. The outlet vane angle is 15°. The outlet relative velocity of water is reduced by 15% compared to inlet relative velocity. Assuming mechanical efficiency = 88%. Determine:

i) hydraulic power
ii) Brake power and
iii) overall efficiency of the system.

Q. 8. What are various energies associated with a centrifugal pump. The inside and outside diameters of a centrifugal pump impeller are 25 cm and 50 cm respectively. The pump is discharging 0.2 m^3/s when running at 800 rpm against total head of 25 m. The flow area remains constant as 0.08 m^2. The exit blade angle is 30°. Find out :

i) inlet vane angle
ii) manometric efficiency
iii) loss of head at the inlet when the flow is reduced by 30% of the original value without changing the speed of the pump.

Q. 9. What is difference between gear and piston pump. Explain the working of the following hydraulic devices with the help of neat diagrams.

i) Accumulator
ii) Intensifier
iii) Hydraulic ram