

Total No. of Questions : 09]

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B.Tech. (Sem. - 6th)
FLUID MACHINERY
SUBJECT CODE : ME - 306
Paper ID : [A0821]

[Note: Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Explain the difference between impulse and reaction turbine.
- b) Explain the term dynamic machines.
- c) Classify turbines on the basis of direction of flow.
- d) What is meant by scale effect?
- e) List down some advantages of centrifugal pumps over displacement pumps.
- f) What do you understand by specific speed of a centrifugal pump?
- g) Explain the term negative slip as referred to reciprocating pumps.
- h) Define the term Net Positive Suction Head.
- i) Explain in brief function of Surge tanks.
- j) Explain working of Hydraulic Accumulator.

Section - B

(4 × 5 = 20)

- Q2)** Obtain an expression for the specific speed of hydraulic turbines and pumps and explain in brief its significance.
- Q3)** Explain with neat sketch the operation of Kaplan turbine, governing of Kaplan turbines and their performance characteristics.

Q4) Explain with neat sketch, the construction and working of an air lift pump. Mention its advantages.

- Q5)** The following data relate to a Pelton wheel: Head = 72 m, speed of wheel = 240 rpm., shaft power of the wheel = 115 kW, speed ratio = 0.45, coefficient of velocity = 0.98, overall efficiency = 85%. Design the Pelton wheel.
- Q6)** An inward flow pressure turbine has runner vanes which are radial at the inlet and inclined backward at 45° to the tangent at discharge. The guide vanes are inclined at 15° to tangent at inlet and velocity of water leaving the guides is 24 m/sec. Determine correct speed for runner and absolute velocity of water at point of discharge if diameter at entry is twice that at discharge and width at entry is 0.6 times that at discharge.

Section - C

(2 × 10 = 20)

- Q7)** Water under a head of 300 m is available for the hydel-plant situated at a distance of 2.35 km from the surface. The frictional losses of energy for transporting water are equivalent to 26 J/N. A number of Pelton wheels are to be installed generating a total output of 18 MW. Determine the number of units to be installed, diameter of the Pelton wheel and the jet diameter when the followings are available; wheel speed 650 rpm, ratio of bucket to jet speed 0.46, specific speed not to exceed 30 (m,kW, rpm), C_v and C_d for the nozzle 0.97 and 0.94 respectively and the overall efficiency of the wheel 87%.
- Q8)** The internal and external diameter of the impeller of a centrifugal pump which is running at 1000 rpm are 200 mm and 400 mm respectively. The discharge through the pump is $0.04 \text{ m}^3/\text{s}$ and velocity of flow is constant and equal to 2.0 m/s. The diameters of the suction and delivery pipes are 150 mm and 100 mm respectively and suction and delivery heads are 6m (abs.) and 30 m (abs.) of water respectively. If the outlet vane angle is 45° and the power required to drive the pump is 16.186 kW determine: a) vane angle of the impeller at the inlet b) the overall efficiency of the pump and c) manometric efficiency of the pump.
- Q9)** A single acting reciprocating pump has a stroke length of 15 cm. The suction pipe is 7 m long and the ratio of the suction diameter to the plunger diameter is $\frac{3}{4}$. The water level in the pump is 2.5 m below the axis of the pump cylinder, and the pipe connecting the sump and the pump cylinder is 7.5 cm diameter. If the crank running at 75 rpm, determine the pressure head on the piston: a) the beginning of the suction stroke b) the end of the suction stroke and c) the middle of the suction stroke. Take the coefficient of friction as 0.001.

