

Roll No.

Total No. of Questions : 09]

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

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

(10 × 2 = 20)

- Q1)** a) Why are the vanes made curved?
b) Define degree of reaction.
c) How does discharge of centrifugal pump vary with speed.
d) At what point in a Francis turbine does cavitation occur?
e) What is the function of surge tank?
f) What do you understand by priming of pumps?
g) What is the purpose of fitting air vessels in reciprocating pumps?
h) What is a torque convertor and where is it used?
i) Why is bucket in pelton turbine hemispherical?
j) What is thoma cavitation factor.

Section – B

(4 × 5 = 20)

- Q2)** A jet of water at 50 m/s strikes a Series of vanes moving at 15 m/s. The jet is inclined at 20° to the direction of motion of vanes. If relative velocity at outlet is 90% of that at entry and velocity at exit is normal to direction of motion, find vane angles at entry and exit.
- Q3)** a) Discuss the factors affecting selection of water turbines.
b) Explain the shape of pelton turbine bucket, and describe how it is designed and how would you find out the number of buckets required?
- Q4)** A pelton turbine produces 25MW when running at 750 rpm under a head of 1770 m. If the speed ratio is 0.46 and $C_u = 0.98$ find dia of jet and dia of wheel. Assume $\eta = 0.85$.
- Q5)** A Francis turbine is working under a head of 100 m and develops 20 mw at 200 rpm. Find the maximum length of conical draft tube when 1m sink's below the tail race. Assume atmospheric pressure as 10.3 m of water and

$$\sigma_c = 0.625 \left(\frac{N_s}{387.78} \right)^2$$

Take $H_v = 2.5$ m of water.

- Q6)** a) What is an intensifier and explain its working with the help of a neat diagram?
b) What is meant by NPSH and discuss its significance?

Section – C

(2 × 10 = 20)

- Q7)** a) Show that in case of single acting pump the ratio of work done against pipe friction with air vessels compared with no air vessel is $3/(2\pi^2)$.
b) What are the advantage of multistage pumps?

- Q8)** The impeller of a centrifugal pump runs at 90 rpm and has vanes inclined at 120° to direction of motion at outlet. The manometric η is 75%. Find (a) dia of impeller at exit and (b) vane angle at inlet. The dia of impeller at exit is double than that at inlet and velocity of flow is constant at 2.5 m/s.
- Q9)** Write short notes on the following:
- a) Euler equation for energy transfer in turbomachines.
 - b) Design of Kaplan turbine.

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