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Total No. of Pages: 02
Total No. of Questions: 09

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

Time: 3 Hrs.

Max. 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

(10x2=20)

1.
 - (a) Explain impulse momentum principle.
 - (b) What are the basic components of a turbomachine?
 - (c) What is the difference between impulse and reaction turbines?
 - (d) Define specific speed of the turbine.
 - (e) Define degree of reaction.
 - (f) What is the function of draft tube?
 - (g) What is priming.
 - (h) What is scale effect?
 - (i) What is slip in reference to reciprocating pumps?
 - (j) What is fluid coupling?

SECTION-B

(4x5=20)

2. A nozzle of 5 cm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s. Find the force on the plate, the work done and the efficiency of the jet.
3. A Pelton wheel having semi-circular buckets function under a head of 150 m and consumes 50 litres per second of water. If 60 cm diameter wheel turns 600 revolutions per minute, make calculations for power available at the nozzle and the hydraulic efficiency of the wheel. Presume coefficient of velocity $K_v = \text{unity}$.
4. Explain the working of a Francis turbine with a neat sketch.
5. Define cavitations. Why does it occur and what are its effects.
6. Prove that the work saved in overcoming friction in pipelines by fitting air vessels is 84.8% for single acting reciprocating pump.

SECTION-C

(2x10=20)

7. For a Kaplan turbine with runner diameter 4m, the discharge is $60 \text{ m}^3/\text{s}$ and the hydraulic and mechanical efficiencies are stated to be 90 percent and 94 percent respectively. The diameter of boss is 0.3 times the runner diameter and the speed ratio is 2. Assuming that the discharge is free and there is no swirl at the outlet, calculate the net available head on the turbine, the power developed and specific speed.
8. A centrifugal pump impeller has diameter of 60 cm and width of 6 cm at the outlet. The pump runs at 1450 rpm and delivers $0.8 \text{ m}^3/\text{s}$ against a head of 80m. The leakage loss after the impeller is 4% of discharge, the external mechanical loss is 10 kW and the hydraulic efficiency is 80 percent. Determine the blade angle at outlet, the power required and the overall efficiency of the pump.
9. Write short notes on:
 - (a) Simple and Differential Accumulator
 - (b) Intensifier.

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