

Roll No.

--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages: 02

Total No. of Questions: 09

B.Tech. (ME) (Sem. – 4)
FLUID MACHINES
Subject Code: BTME402-18
M Code: 77547
Date of Examination : 22-11-2023

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS 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. Answer briefly :

- a) Define the term Impact of jet.
- b) What are the functions of draft tube?
- c) What is impulse momentum equation?
- d) List the advantages of Kaplan Turbine over Francis Turbine.
- e) What is the basis on which Hydraulic Turbines are classified.
- f) What are the functions of a multistage pump?
- g) What is Thoma's cavitation factor for Turbine?
- h) Why the buckets of Pelton wheel are provided with an under-cut?
- i) Define specific speed of pump and write its expression.
- j) What role do the air vessels play in reciprocating pumps?

SECTION-B

2. A jet of water moving at 12 m/s impinges on a concave shaped vane to deflect the jet through 20° when stationary. If the vane is moving at 5 m/s. find the angle of jet so that there is no shock at inlet Also, compute the absolute velocity of the jet at exit both in magnitude and direction and the work done per second per kg of water. Assume that the vane is smooth.
3. Differentiate between impulse and reaction turbines.
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. A single acting reciprocating pump of 20 cm bore and 30 cm stroke handles water. The suction pipe diameter and length are 12 cm and 8 m respectively. The delivery pipe diameter and length are 12 cm and 24 m respectively. The speed of operation is 32 rpm. Determine friction power with or without air vessels. Take Darcy's friction factor, f as 0.02.
6. With the help of a neat diagram, explain the working principle of fluid coupling. Also, describe the slip and the efficiency of the fluid coupling.

SECTION-C

7.
 - a) Why is the efficiency of Kaplan turbine nearly constant irrespective of speed variation under load?
 - b) A Kaplan turbine is to be designed to develop 7350 kW; the net available head being 5.5 m, the other relevant data is speed ratio: 2.08; flow ratio: 0.68; overall efficiency: 60 % and diameter of bore: $1/3$ of the runner diameter. Make calculations for runner diameter, its speed and specific speed.
8.
 - a) Discuss the influence of exit blade angle on the performance and efficiency of a centrifugal pump. Assume radial flow at entrance.
 - b) A centrifugal pump is required to lift water against total head of 40 m at the rate of 50 liters per second. Find the power of the pump, if the overall efficiency is 62%.
9. **Explain the construction and working of any two hydraulic devices with the help of suitable diagrams :**
 - a) Differential accumulator
 - b) Fluid coupling
 - c) Intensifier.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.