

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

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Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 4th

Name of Subject: Fluid Mechanics and Machinery

Subject Code: PCME-108

Paper ID: 16198

Scientific calculator is Allowed

Detail of allowed codes/charts/tables etc. N/A

Time Allowed: 03 Hours

Max. Marks: 60

**NOTE:**

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

**Part – A**

[Marks: 02 each]

**Q1.**

- a) Define the overall efficiency of the turbine.
- b) What is the function of a draft tube?
- c) Define Net Positive Suction Head (NPSH) and write its expression.
- d) What is the specific speed of the turbine?
- e) What do you understand by hydrostatic law?
- f) Differentiate between absolute and gauge pressure.

**Part – B**

[Marks: 04 each]

**Q2.** What is a negative slip in the Reciprocating pump? Explain.

**Q3.** How are fluid machines classified? Explain briefly the difference between various types of hydrodynamic machines.

**Q4.** Water is flowing through a pipe of 5 cm diameter under a pressure of  $29.43\text{N/cm}^2$ (gauge) and with a mean velocity of  $2.0\text{m/s}$ . Find the total head or total energy per unit weight of the water at a cross-section, which is 5 m above the datum line.

- Q5. What are the gauge pressure and absolute pressure at a point 3 m below the free surface of a liquid having a density of  $1.53 \times 10^3$  if the atmospheric pressure is equivalent to 750 mm of mercury? The specific gravity of mercury is 13.6 and density of water = 1000 kg/m<sup>3</sup>.
- Q6. Derive an expression for the minimum speed for starting a centrifugal pump.
- Q7. Drive Bernoulli's equation for adiabatic process for compressible flow.

Part – C

[Marks: 12 each]

- Q8. What is the difference between U-tube manometers and inverted U-tube differential manometers? Where are they used?

OR

A centrifugal pump impeller has diameter of 60 cm and width 6 cm at outlet. The pump runs at 1450 rpm and delivers 0.8 m<sup>3</sup>/s against a head of 80m. The leakage loss after the impeller is 4% of discharge, the mechanical loss is 10 kW and the hydraulic efficiency is 80%. Determine the blade angle at outlet, the power required and overall efficiency of pump.

- Q9. State the "Impulse momentum equation", and also give its applications.

OR

A Pelton wheel is to be designed for the following specifications: Power (BP) 9560 kW, Head = 350 m, speed = 750 r.p.m., overall efficiency = 85%, jet diameter not to exceed 1/6<sup>th</sup> of wheel diameter. Determine i) wheel diameter, ii) diameter of jet, iii) number of jets required.

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