Roll No. Total No. of Pages: 02

Total No. of Questions: 09

B.Tech. (ME) (Sem.-6<sup>th</sup>)
FLUID MACHINERY

Subject Code: ME-306 Paper ID: [A0821]

Time: 3 Hrs. Max. Marks: 60

## **INSTRUCTION TO CANDIDATES:**

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

## **SECTION-A**

- 1. Write briefly:
  - (a) What is rate of change of moment of momentum and what are the units?
  - (b) In case of Pelton turbine why the water is deflected through about 165° and not 180°?
  - (c) Define unit speed and unit power.
  - (d) What is max. permissible vacuum during suction stroke of a reciprocating pump?
  - (e) How can you find out whether courtation will occur or not in Francis turbine?
  - (f) If the turbine discharges radially, which velocity becomes zero?
  - (g) Make a sketch of a intensifier.
  - (h) What are advantages of multistage pumps?
  - (i) Why are blades of Kaplan turbine twisted?
  - (j) Define hydraulic  $\eta$  of a turbine.

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## SECTION-B

- 2. A jet of water moving at 12 m/s impinges on vane shaped to deflect the jet through 120° when stationary. It vane is moving at 5 m/S and inlet and outlet blade angles are equal, find the angle of jet, velocity of whirl and relative velocity at inlet.
- 3. How would you proceed to design a Francis turbine? Explain by drawing velocity triangles.
- 4. Show that the pressure rise in impeller of a centrifugal pump is given by

$$\Delta_p = \frac{1}{2g} \left[ V_{f_1}^2 - u_2^2 - v_{f_2}^2 \cos ec^2 \phi \right]$$

with usual notations.

- 5. Show that Pelton turbine is a low specific speed turbine.
- 6. The length and dia of a single acting reciprocating pump are 30 m and 10 cm respectively and water is delivered to a tank which is 20 m above the centre of pump. Find head due to acceleration at the beginning of delivery stroke. The stroke length 35 cm. Pump speed = 3.5 rpm.

## **SECTION-C**

- 7. Explain the construction and operation of a differential accumulator by means of a neat diagram.
- 8. A Kaplan turbine is to be designed to develop 7357.5 kW shaft power. The available head is 5.5 m. Assume speed ratio 2.09, flow ratio 0.68 and overall  $\eta$  is 60%. The Boss diameter is  $\frac{1}{3}$  of runner diameter. Find diameter of runner and speed of turbine.
- 9. Write notes on the followings:
  - (a) Cavitation in hydraulic turbines.
  - (b) Shape of buckets of Pelton turbines.