Unit 6 - Week 5

Week 5 Assignment 5

1) Minimum conductivity (in micromho/cm) a fluid must have so that its flow can be measured using an electromagnetic flow meter is:

   - (a) 5
   - (b) 12
   - (c) 0.5
   - (d) 2

   **Accepted Answers:**
   - (b) 12

2) An electromagnetic flowmeter can measure:

   - (a) laminar flow
   - (b) turbulent flow
   - (c) both laminar and turbulent flow

   **Accepted Answers:**
   - (c) both laminar and turbulent flow

3) For a Doppler shift ultrasonic flowmeter, which of the following statement is NOT correct?

   - (a) Piezoelectric crystals are used to generate ultrasonic wave.
   - (c) The frequency of received ultrasonic wave is always less than that of the transmitted wave.
   - (c) The meter does not work if the fluid contains some scattering particles and/or air bubbles.
   - (d) All the above

   **Accepted Answers:**
   - (c) The meter does not work if the fluid contains some scattering particles and/or air bubbles.

4) For a turbine flowmeter, which of the following statement is TRUE?

   - (a) 5
   - (b) 12
   - (c) 0.5
   - (d) 2

   **Accepted Answers:**
   - (b) 12
   - (c) 0.5
   - (d) 2

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(a) Both the amplitude and frequency of the flowmeter output remain constant with respect to the flow.
(b) Amplitude remains constant however the frequency of the flowmeter output varies with the flow.
(c) Frequency remains constant however the amplitude of the flowmeter output varies with the flow.
(d) Both the amplitude and frequency of the flowmeter output changes with the flow.

Accepted Answers:
(d) Both the amplitude and frequency of the flowmeter output changes with the flow.

5) Hot wire anemometer is based on the principle of heat transfer by-

(a) convection
(b) conduction
(c) radiation
(d) all of the above

Accepted Answers:
(a) convection

6) A right angled V-notch is employed to measure the discharge of water. If the head above the sill is measured as 0.25 m, estimate the discharge (in ltr/sec) if \( C_w = 0.6 \) (width of notch \( L = 0.35 \) m, acceleration due to gravity \( g = 9.81 \) m/sec\(^2\), water density = 1000 kg/m\(^3\)).

(a) 32
(b) 0.032
(c) 64
(d) 0.064

Accepted Answers:
(a) 32

7) A Doppler shift ultrasonic flow meter uses two piezoelectric crystals, each having a natural frequency of 3.6 MHz. These crystals are used as transmitter and receiver. The transmitter directs an ultrasonic wave into the pipe which makes an angle of 45\(^\circ\) with the direction of flow. Calculate the received frequency for a fluid velocity of 10 m/sec. Assume the velocity of sound in fluid to be 1000 m/sec.

(a) 1.774 MHz
(b) 3.549 MHz
(c) 5.323 MHz
(d) 2.655 MHz

Accepted Answers:
(b) 3.549 MHz
A turbine flow meter consists of four mild steel blades rotating at an angular velocity given by the following relation \( \omega = 50000 \cdot Q \), where \( Q \) is the flow rate in \( \text{m}^3/\text{s} \). Total flux linked with the coil of the magnetic transducer is given by \( \Phi = 4.25 + \cos 4\theta \) mWb, where \( \theta \) is the angle between the blade assembly and the transducer. Range of the flow meter is 0.5 to 5 ltr/s. Calculate the amplitude and frequency of the transducer output at (i) maximum and (ii) minimum flow rates.

- (a) (i) 2 V, 159.15 Hz (ii) 0.2 V, 15.91 Hz
- (b) (i) 1 V, 159.15 Hz (ii) 0.1 V, 15.91 Hz
- (c) (i) 1 V, 318.3 Hz (ii) 0.1 V, 15.91 Hz
- (d) (i) 2 V, 318.3 Hz (ii) 0.2 V, 31.82 Hz

Accepted Answers:
(b) (i) 1 V, 159.15 Hz (ii) 0.1 V, 15.91 Hz