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## Unit 6 - Week 5

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### Week 5 Assignment 5

1) 2 points  
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- 2 points

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

**Accepted Answers:**

*(c) both laminar and turbulent flow*

3) 2 points  
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? 2 points

- (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- 2 points

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

**Accepted Answers:**

*(a) convection*

6) 2 points

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  $C_d = 0.6$  (width of notch  $L = 0.35$  m, acceleration due to gravity  $g = 9.81$  m/sec<sup>2</sup>, water density =  $1000$  kg/m<sup>3</sup>).

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

**Accepted Answers:**

*(a) 32*

7) 2 points

A Doppler shift ultrasonic flowmeter 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° 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*

8) 5 points

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*

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Funded by

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