Assignment 2

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-02-13, 23:59 IST.

1) A signal is presented as $u(t) = 10 \sin(60t)$. The approximate value of the time period of this signal is

- 60 ms
- 105 ms
- 277 ms
- 401 ms

No, the answer is incorrect.

Score: 0

Accepted Answers: 105 ms

2) Slew rate is defined as

- maximum rate of change in input amplitude a transducer can handle
- maximum rate of change in output amplitude a transducer can handle
- maximum rate of change in input phase a transducer can handle
- maximum rate of change in output phase a transducer can handle

No, the answer is incorrect.

Score: 0

Accepted Answers: maximum rate of change in input amplitude a transducer can handle

3) Static sensitivity can be defined for which type of transducer(s)?

- only for zeroth-order transducer
- only for first-order transducer

1 point
4) A liquid-in-glass thermometer can be considered as a first-order instrument. Among the followings, which one is an efficient option of enhancing the static sensitivity, but may not affect the time constant?

- use of a thermometric fluid with higher heat capacity
- use of a thermometric fluid with higher volumetric expansivity
- using a bulb with larger diameter
- enhancing the convective heat transfer coefficient

**No, the answer is incorrect.**  
Score: 0  
**Accepted Answers:**  
use of a thermometric fluid with higher volumetric expansivity

5) In relation with the frequency response of a transducer, time delay is defined as

- the phase lag present in the output signal
- the time period of the imposed periodic signal
- the ratio of phase lag and time constant of the transducer
- the ratio of phase lag and angular frequency

**No, the answer is incorrect.**  
Score: 0  
**Accepted Answers:**  
the ratio of phase lag and angular frequency

6) A first-order instrument is expected to provide output with at least 95% accuracy within 0.05 s of imposing a step input. Then the largest allowable time constant of this instrument (correct to 1 decimal place) is ____________ ms.

**No, the answer is incorrect.**  
Score: 0  
**Accepted Answers:**  
(Type: Range) 15,18

7) The temperature of a furnace is increased at a constant rate of 10°C per minute. A first-order sensor is used to monitor the continuous progress in temperature. If a maximum recording error of 3°C can be allowed for the sensor under steady-state, the maximum value of system time constant is ____________ s.

**No, the answer is incorrect.**  
Score: 0  
**Accepted Answers:**  
(Type: Numeric) 18
8) A balloon is rising upward through atmosphere with a constant velocity of 6 m/s, while the surrounding temperature decreases by 0.15 °C for every 30 m increase in altitude. A first-order instrument with time constant of 15 s is mounted on the balloon to sense the temperature of the immediate surrounding. If the thermometer reads 0 °C at 3000 m, then the true altitude where 0 °C occurs is ___________ m.

   Hint

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 2900,2920

1 point

9) A first-order instrument is to be used for measuring periodic signals with frequency content up to 100 Hz, with a maximum allowable amplitude inaccuracy of 5%. If the transducer is designed with the maximum possible time constant, the magnitude of the phase shift for an input signal with frequency of 50 Hz (correct to 2 decimal places) will be ____________ degree.

   Hint

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 9.20,9.40

1 point

10) A second-order sensor is used to measure the periodic variations in pressure inside the cylinder of a CI engine operating within a typical speed range of 3000 to 6000 rpm. The sensor can be conceived as a spring-mass-damper system with $m = 3.7g$ and $k = 1.31$ kN/m. If the sensor implies very light damping ($\zeta = 0.025$), then the amplification ratio (correct to 2 decimal places) corresponding to the highest operating frequency of the engine is ____________.

   Hint

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 8.5,9.1

1 point