

Registration No: 10

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Total Number of Pages: 02

B.Tech  
PEI5I101

5<sup>th</sup> Semester Regular Examination 2017-18

Instrument Devices and System-II

BRANCH: AEIE, EIE, IEE

Time: 3 Hours

Max Marks: 100

Q.CODE: B390

Answer Question No.1 and 2 which are compulsory and any four from the rest.  
The figures in the right hand margin indicate marks.

**Q1** Answer the following questions: *multiple type or dash fill up type* (2 x 10)

- a) The operation of Pirani gauge is based on  
a) ionization of gas at low pressure    b) variation of volume with pressure    c) variation of viscosity with pressure    d) variation of thermal conductivity of gas with pressure.
- b) A piezoelectric type accelerometer has a sensitivity of 100 mV/g. The transducer is subjected to a constant acceleration of 5g. The steady state output of transducer will be-----.
- c) Measurement of viscosity involves measuring ----- force.
- d) When the reading of Ph meter changes from 5 to 7, hydrogen ion concentration of the solution is  
a) halved    b) doubled    c) increased 100 times    d) decreased 100 times
- e) An example of a variable area device for measuring flow is -----.
- f) ----- flow meter works on the constant pressure drop principle.
- g) In liquid level gauging  $\gamma$ -ray is used because of -----.
- h) The basic principle of float type level sensor is  
a) force balance    b) motion balance    c) energy balance    d) none of these.
- i) Photo diodes operate in ----- bias mode.
- j) Wien's Displacement law is derived from ----- law.

**Q2** Answer the following questions: *Short answer type* (2 x 10)

- a) What is the principle of operation of Hall effect transducer?
- b) What is the principle of operation of bolometer?
- c) What is non-Newtonian fluid? Give one example.
- d) Why differential pressure measurement is preferred over individually measuring the two pressures?
- e) Give some application of accelerometers.
- f) What is the advantage and disadvantage of using floats?
- g) Design a 4\*1 MUX using LADDER diagram.
- h) What is Planck's law?
- i) Give an expression for overall attenuation loss ( $\alpha$ ) of a optical fibre of length (L).
- j) What is total internal reflection?

**Q3** a) A manometer uses transformer oil of specific gravity 0.864 as measuring liquid. The scale is graduated in mm of water. If one leg is a 2 mm bore tube and the other a 20 mm well, calculate the angle to the horizontal at which the tube and scale must be inclined to give 4 mm scale deflection for a pressure of 1 mm head of water. Assume 1 mm of water=9.81Pa. (10)

- b) Explain, with neat sketch the construction and working of McLeod gauge. (5)

- Q4 a)** A Venturi tube of throat diameter 6 cm is placed in a water pipe of diameter 10 cm to measure the volumetric flow of rate which is found to be  $0.08 \text{ m}^3/\text{sec}$ . If the density and viscosity of water are  $10^3 \text{ kg/m}^3$  and  $10^{-3} \text{ Pa.s}$  respectively, determine (10)
- i) Reynolds number for these conditions  
ii) Upstream-to-throat differential pressure developed  
(Given discharge coefficient=0.99)
- b)** Explain Doppler frequency shift type ultrasonic flow meter briefly. (5)
- Q5 a)** Based on the effect of change in dimensions explain any two sensors/thermometers for temperature measurement (10)
- b)** Explain, with neat sketch the construction and working of any one ionization gauges briefly. (5)
- Q6 a)** Derive the transfer function for piezoelectric system with ideal charge amplifier. (10)
- b)** Explain the two types of capacitive type Hygrometer briefly. (5)
- Q7 a)** Explain the capacitive type level measurement systems briefly. (10)
- b)** Explain ultrasonic type/gamma type level measurement system briefly. (5)
- Q8 a)** What is conductivity? Explain two pole and four-pole cells measurement arrangement and working to measure conductivity. (10)
- b)** Explain the principle and working of photo resistor briefly. (5)
- Q9 a)** Where radiation pyrometers are being used? Give a brief description of narrow band pyrometer (10)
- b)** Explain the basic structure of PLC briefly. (5)