Registration No. : | | | | | | | | | | |

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B. Tech

PCEI 4305

Sixth Semester Back Examination – 2015

INSTRUMENTATION DEVICES AND SYSTEMS - II

BRANCH (S) : AEIE, EIE, IEE

QUESTION CODE : M 239

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 ×10

   (a) What is the principle behind pneumatic actuator ?

   (b) What is the advantage and disadvantage of using floats ?

   (c) Give the proper justification, why the glass fiber is being used in telecommunication system.

   (d) Generally SCRs are characterized by what specifications ?

   (e) What is Wein's displacement law ?

   (f) What is the basic principle of pH measurement ?

   (g) What is the role of charge amplifier in piezoelectric measurement system ?

   (h) What is the role of relay in ladder logic ?

   (i) What is the relation of numerical aperture and core/cladding index difference ?

   (j) Why differential pressure measurement is preferred over individually measuring the two pressures ?

2. A piezoelectric crystal, acting as a force sensor, is connected by a short cable of negligible capacitance and resistance to a voltage detector of infinite bandwidth and purely resistive impedance of 10 MΩ. 10

P.T.O.

(a) Use the crystal data below to calculate the system transfer function and to sketch the approximate frequency response characteristics of the system.

(b) The time variation in the thrust of an engine is a square wave of period 10 ms. Explain carefully, but without performing detailed calculations, why the above system is unsuitable for this application.

(c) A charge amplifier with feedback capacitance C_F = 1000 pF and feedback resistance R_F = 100 MΩ is incorporated into the system. By sketching the frequency response characteristics of the modified system, explain why it is suitable for the application of part (b).

Crystal data : Charge sensitivity to force = 2 pC N-1
Capacitance = 100 pF
Natural frequency = 37 kHz
Damping ratio = 0.01

3. (a) Briefly explain construction and characteristics of various types of control valves used in process control. 5

(b) Derive an expression for K_{md} while coupling a fiber to detector. 5

4. (a) With suitable diagram, describe construction and operation of any one Humidity sensor. 5

(b) Give a brief description of ultrasonic level indicator. 5

5. (a) Give a brief description of principle of operation of narrow band pyrometer with its advantage and disadvantage. 5

(b) Differentiate LED and photodiode in its principle of operation. 5

6. (a) Explain the different designs of magnetically coupled floats used for indicating liquid levels. 6

(b) Explain the γ-ray type level indicator briefly. 4

7. (a) Explain briefly about pneumatic system. 5

(b) What is ladder diagram ? Explain its elements with symbols used in ladder diagram. 5

8. Write short notes any **two** of the following : 5×2

(a) Photo resistor

(b) Hydraulic actuator

(c) PLC

(d) Piezoelectric accelerometer.