B.E. INSTRUMENTATION & ELECTRONICS ENGG SECOND YEAR SECOND SEM2018

Subject :**PROCESS INSTRUMENTATION-I**   Time : 3 hours   Full Marks : 100

Answer Q1 and Q2

1a) Draw a simple circuit diagram of a 2-wire transmitter that converts a voltage signal to a current signal suitable for transmission, and hence derive an expression for the output current in terms of the input voltage and circuit parameters. Discuss the zero and span adjustments. Why are two diodes used in series with the circuit ?   9 + 4 + 2 = 15

1b)Why is current transmission preferred over voltage transmission ? Explain the concept of "live zero". 5

OR

1a)With the help of a neat sketch explain the operation of a flapper nozzle assembly and draw it's input-output characteristics. What is a Pneumatic Relay and how does it work ? Explain the necessity and advantage of using a pneumatic relay in conjunction with a flapper-nozzle assembly.   6 + 4 + 5 = 15

1b)What is an I/P Converter ? Why is it used ? What is the range of input and output signals of an I/P Converter ? 5

2a)How is an incremental encoder used to measure angular speed of a rotating body ? How is the direction of rotation determined ? Draw necessary diagrams in support of your answer. What is a Tachometer encoder?   8

2b)Discuss the SSI method of encoder data transfer. Explain how the "master" asks for a repeat transmission of the data for error checking.   12

OR

2a)Explain the operation of a seismic accelerometer. Derive necessary expressions as required. Draw the frequency response curve for the same and discuss its significance.   10 + 4 =14

2b)How can the speed of a rotating body having one distinguishable mark, be determined with a stroboscope if it is known that the speed lies between 1600 and 2000 rpm ?   6

Answer any two questions from amongst Q3, Q4 and Q5

3a)With the help of necessary diagrams and circuits, explain the working of either a resonant wire or a capacitive type pressure transmitter.   10

3b)A gauge pressure transmitter is calibrated over a span of 10 kgf/cm2. If this transmitter has a 20 % zero suppressed range, find the calibrated range of the transmitter and draw the calibration curve.   5

4a) Draw a neat sketch of a pressure transmitter installed in a steam line.How are the internals of the transmitter protected against the high temp steam ?   5

4b) What do you understand by a chemical seal ?   5

4c) The scale reading of an inclined tube mercury manometer is 20 cm against an unknown pressure P. The angle of inclination with the vertical is 60 deg. If this pressure P is measured by a Pressure Transmitter having a calibrated range of 20,000 Pa, find the output from the transmitter.   5

Answer Q5, Q6 and Q7

5) Explain the operation of a Hot Cathode Ionisation gauge. What is soft x-ray effect and how is it minimised ? What are the advantages of using this gauge over a cold cathode type ?   8 + 4 + 3 = 15

6a) Describe the operation of a variable speed weigh feeder and explain how the flow rate of the materials is controlled.   10

6b) What do you understand by the characteristic value of a load cell ? In this context, explain the function of the "sense" wires of a 6 wire load cell.   5

OR

6b) Three load cells for platform weighing are connected to the Weighing Controller via a Summing Junction Box. Draw the interconnection diagram.   5

7) Write short notes on   5 + 5 + 5 = 15
   a) Zero – Span interaction in Transmitters
   b) Stroboscopes or Hall Effect Transducers
   c) Bourdon Tube Pressure Sensor or Thermal Conductivity Gauge