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BIME-016

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

00090

June, 2016

BIME-016 : MECHATRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a) Identify the sensor, signal conditioner and display elements in the measurement system of a Bourdon pressure gauge.

(b) Differentiate between active and passive sensors. What are the requirements for selecting a sensor ? *5+5*

2. (a) Explain the significance of the following information given in the specification of transducers :

(i) A capacitive linear displacement transducer
Non-linearity and hysteresis : ± 0·01% of full range

(ii) A capacitance fluid pressure transducer
Accuracy : ± 1% of displayed reading

(b) Suggest a sensor that could be used, as part of a control system, to determine the difference in levels between liquids in two containers. The output is to provide an electrical signal for the control system. *5+5*

3. (a) Describe the basic details of a shuttle valve with the help of a sketch.

(b) Explain the principle of a pilot-operated valve and its applications. *5+5*

4. (a) Explain the working and draw the symbols for

(i) a 4/2 valve, and

(ii) a directional valve.

(b) A pneumatic system is operated at a pressure of 1000 kPa. What diameter cylinder will be required to move a load requiring a force of 12 kN ? *5+5*

5. (a) A 6-bit D/A converter gives an output voltage of 17·250 volts for an input of 010111. What is the step size, the full range voltage, and the percentage resolution ?

(b) What will be the change in resistance of an electrical resistance strain gauge with a gauge factor of 2·1 and resistance 50 Ω, if it is subjected to a strain of 0·001 ? *5+5*

6. (a) A memory chip has 8 data lines and 16 address lines. What will be its size ?

(b) Draw a block diagram of a basic microcontroller and explain the function of each subsystem. *4+6*

7. (a) Draw the ladder rungs to represent; Either of two, normally open, switches have to be closed for a coil to be energized and operate an actuator.

(b) What are the techniques for non-destructive testing employed in ultrasonic testing ? What are its advantages as compared to other methods of non-destructive testing ? Is it applicable for non-ferrous metals ? Why or why not ? *4+6*

8. (a) State whether the following statements are *True* (T) or *False* (F) :

(i) Magnetic particle test can be done on all metals.

(ii) Radiography has limitation on metal thickness.

(iii) Industrial practice to mention hardness value as Rockwell C.

(iv) Eddy current test can also be used to measure the thickness of a non-conducting coating such as paint, on a metal.

(v) Elastic waves with frequencies higher than the audio range are known as ultrasonic.

(b) What is a sensor ? Explain active and passive sensors. Also list out various performance parameters for sensors and transducers. *5+5*