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BIME-016

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

Term-End Examination

00905 **December, 2014**

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

(b) Describe the components of a continuous sensing system. *5*

2. (a) What are the advantages and limitations of hydraulic systems over other systems ? *5*

(b) Explain the working of wrist sensors. *5*

3. (a) Explain, what is meant by sequential control with the help of a suitable example. *5*

(b) State steps that might be present in the sequential control of a dishwasher. *5*

4. (a) Identify the various elements that might be present in a control system involving thermostatically controlled electric heater. *5*

(b) Explain the function of a Programmable Logic Controller. *5*

5. (a) Suggest the elements that might be considered for the measurements system to be used to continuously monitor and record the temperature of a room with an accuracy of $\pm$ 1° C. *5*

(b) What are the limitations of two steps (on-off) controls and in what situation is such a control system commonly used ? *5*

6. (a) An accumulator of volume 120 litres is pre-charged to a pressure of 120 bar. It is put in a hydraulic system operating at a pressure of 180 bar. If accumulator has to supply 17 litres of oil due to sudden demand in the system, what will be drop in the system pressure ? *5*

(b) A double acting cylinder has a pressure of 40 bar acting on both sides. The cross-sectional area of two sides are 200 cm^2 and 100 cm^2. Find out the net load against which the cylinder can operate. If a pressure compensated flow control valve is put in the return line which allows only a flow of 10 litres/min, through it, at what speed will the cylinder move ? *5*

7. (a) Assume a DC motor with the following parameters :

Motor torque control = 0·0848 Nm/amperes.

Back EMF control = 0·0848 volts/(rad/s)

Armature resistance = 0·75 Ω

Moment of inertia = 0·00001696 kg/m^2.

With zero frictional load and taking a feed forward gain of 2, determine the motor response for a unit step function. *5*

(b) A motor is running at 3,000 rpm. If it is to be controlled using proper width modulation, what duty cycle will be needed for running at 2,000 rpm ? *5*

8. What are the various types of CAMs used in mechanism of mechanical system ? Explain in detail with neat sketches and suitable examples. *10*

9. Explain how the mechanical system is different from hydraulic and pneumatic systems. Discuss the relative advantages and disadvantages of the pneumatic system over hydraulic system. *10*

10. (a) A 6-bit D/A converter gives an output voltage of 8·625 volts for an input of 010111. What is the step size, the full range voltage and the percentage resolution ? *7*

(b) Show the binary addition and subtraction of 250 (decimal) and 450 (decimal). *3*
