No. of Printed Pages : 3

BME-006

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. AEROSPACE ENGINEERING (BTAE)

00994

Term-End Examination

June, 2017

BME-006 : MECHATRONICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Explain the operation of lever type and push type mechanical switches with the help of neat sketches.

(b) Describe the working of a rotary potentiometer. *5+5*

2. (a) What is the principle of operation of an optical encoder ? Explain with the help of a suitable diagram.

(b) Describe the working of a hydraulic power pack with the help of a suitable diagram. *5+5*

3. (a) Describe the functioning of a relay with schematic diagrams.

(b) Explain the principle of a stepping motor with the help of a suitable diagram. *5+5*

4. (a) A 6-bit D/A converter gives an output voltage of 8·00 volts for an input of 010100. What is the step size, the full range voltage and the percentage resolution ?

(b) Explain the working of a solenoid controlled pilot operated valve with the help of a neat sketch. *5+5*

5. (a) Write down the different types of positive displacement pumps with their applications.

(b) Describe the various methods of speed control of a DC motor. *5+5*

6. (a) What is inverse Laplace transform ? Where is it used ?

(b) Explain the working principle of a relay. *5+5*

7. (a) Compare microcontroller, microcomputer and microprocessor.

(b) Draw the relay ladder rung for two push button switches which are normally open and both have to be closed for a motor to be operated. *5+5*

8. (a) Explain the principle of operation of an Ultrasonic Range Sensor with the help of a neat diagram.

(b) Apply the Routh-Hurwitz criterion to determine the stability of systems whose characteristic equations are given by :

(i) $s^4 + 6s^2 + 5s + 12 = 0$

(ii) $s^5 + 4s^4 + 3s^3 + 5s^2 - 12s - 8 = 0$ *5+5*

9. A DC motor takes an armature current of 100 A at 480 V. The resistance of the armature circuit is 0·2 Ω. The machine has 6 poles and the armature is lap connected with 864 conductors. The flux per pole is 0·5 Wb.

Calculate the following : *10*

(i) Speed

(ii) Gross torque developed by the system

10. An automatic beverage plant packages 950 ml of soft drinks in bottles. Suggest a metering system which can be used to serve the purpose. Explain with the help of a neat diagram, its basic elements and its operation. *10*
