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BME-006

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

Term-End Examination

00368

June, 2014

BME-006 : MECHATRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. All questions carry equal marks.*

1. (a) Briefly explain the components of a continuous sensing system. *5*

(b) A typical A/D converter has 12-bit resolution and a full range of 10 volts. What is the percent resolution and voltage resolution of this device ? *5*

2. (a) What is the difference between a thermocouple and a thermistor ? *5*

(b) What is the main advantage of a capacitive proximity switch over the inductive proximity switch ? *5*

3. (a) Describe the working of any cam-controlled system, with the help of a neat diagram. 5

(b) Give the advantages and disadvantages of ball screw over power screw. 5

4. (a) Discuss the relative advantages and disadvantages of a pneumatic system over hydraulic system. 5

(b) What is the difference between a positive and a non-positive displacement compressor ? 5

5. (a) What is a 4/2 directional control valve ? 5

(b) With a suitable sketch, describe servo valve. 5

6. (a) Differentiate between air-amplifier and intensifier. 5

(b) A DC motor is running at 1500 rpm. If it is to be controlled using pulse width modulation, what duty cycle will be needed for running at 1000 rpm ? 5

7. (a) A stepper motor has a step angle of 2 degrees. If it is to be rotated at 200 rpm, what pulse rate should be given to the motor ? 5

(b) With the help of suitable sketch describe closed loop controlled system. 5

8. (a) Explain the working principle of relay with the help of a neat sketch. 5

(b) Draw and explain PLC structure and write the advantages of PLC over microcomputer. 5

9. (a) Define "Scan Time" in PLC programming. 5

(b) Construct a ladder diagram of the circuit of on/off control of lamp given as follows in Figure 1. 5

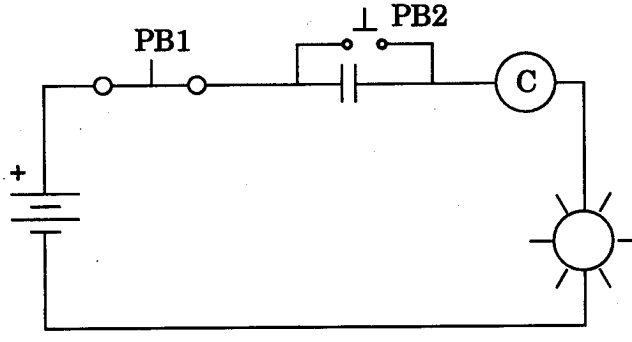
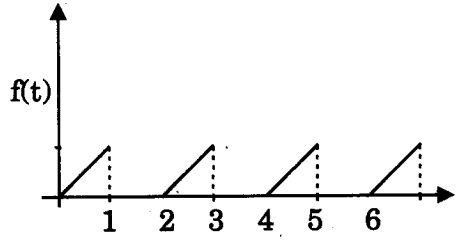


Figure 1

10. (a) Find the Laplace transform of the periodic function shown in Figure 2. 5



Periodic function

Figure 2

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

(i) $s^4 + 5s^3 + 2s + 10 = 0$

(ii) $s^5 - 2s^4 + 2s^3 + 4s^2 - 11s - 10 = 0$ *5*