C 46669 (Pages 2) Name.....

Reg. No.....

EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2008

ME 04 803—MECHATRONICS AND MACHINE CONTROLS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

1. (a) What are the demerits of the plastic film type of potentiometer ?

(b) What is the conversion time for 12-bit ADC with a clock frequency of 1 MHz ?

(c) Propose a model for the metal wheel of a railway carriage running on a metal track.

(d) What is the state of the damping for the systems having the following transfer function ?

$$G(s) = (3s + 20) \Big/ \left(s^2 + 2s + 20\right).$$

(e) What are the applications of actuators ?

(f) Convert the following binary number to decimal number :— 10 0001 0001.

(g) What are applications of sequence value ?

(h) Explain the operation of a pressure relief valve.

(8 × 5 = 40 marks)

Part B

3. (a) Identify the sensor, signal conditioner and display elements in the measurements system of (a) Mercury-in-glass thermometer ; (b) A Bourdon pressure gauge.

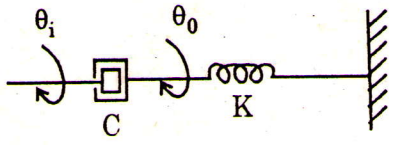
(15 marks)

Or

(b) The water level in an open vessel is to be monitored by a differential pressure cell responding to the difference in pressure between that at the base of the vessel and the atmosphere. Determine the range of differential pressure the cell will have to respond to if the water level can vary between zero height above the cell measurement point and 2 m above it.

(15 marks)

3. (a) Derive an equation relating the input angular displacement θ_i with the output angular displacement θ_0 for the rotational system (refer figure).



(15 marks)

Or

Turn over

(b) A closed-loop system has a forward path having two series element with transfer functions 5 and $\frac{1}{(s+1)}$. If the feed-back path has a transfer function 2/s, what is the overall transfer function of the system ?

(15 marks)

4. (a) Devise a system which will allow a door to be opened only when the correct combination of four push-buttons is pressed, any incorrect combination sounding an alarm.

(15 marks)

Or

(b) Explain with neat diagram working principle of any *one* type of flow control valves.

(15 marks)

5. (a) Explain with neat sketch the working principle of any *two* types of hydraulic pumps.

(15 marks)

Or

(b) Explain with suitable example applications of fast exhaust valves.

(15 marks)

[4 × 15 = 60 marks]