Total No. of Questions : 12]

SEAT No. :

P2261

[Total No. of Pages :4

[4758]-18

T.E. (Mechanical)

MECHATRONICS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Solve Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7or 8, Q.9 or 10, Q.11 or 12.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how microbalance Machine works which is used for measurement of weight in jewellery shop with suitable diagram? **[8]**

b) Compare RTD, Thermocouple and Thermister? **[8]**

OR

Q2) a) For platinum resistance thermometer, the resistance coefficient of temperature is 0.004 Ω/Ω/^{o}C resistance at 40^{o}C is 130Ω. Find the following **[6]**

i) Resistance at 300^{o}C.

ii) Temperature when resistance is 90Ω.

b) Explain in detail temperature compensation. **[4]**

c) List out all level measurement method and explain any one direct method? **[6]**

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Q3) a) Draw and explain principle, working with advantages, disadvantages and applications of LVDT in detail? **[8]**

b) Explain Eddy current type Tachometer with the principle, working and neat diagram? **[6]**

c) Define dead zone and hysteresis? **[2]**

OR

Q4) a) Write short note on limit switches. **[4]**

b) Describe motion measurement technique by optical method? **[8]**

c) A potentiometer with a total range of 350^{o} is supplied with a voltage of 8Vdc. The voltage at the wiper is 3.7 Vdc. What is present angle of pot? **[4]**

Q5) a) What is mean by Nyquist theorem? **[4]**

b) Explain a case study of SCADA. **[6]**

c) Carry out block diagram reduction for the system shown in figure.1. **[8]**

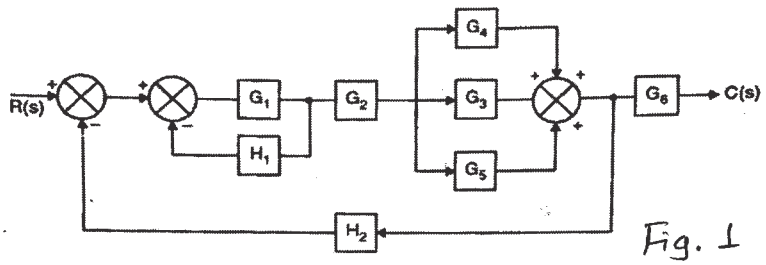

Fig. 1

OR

Q6) a) In case of DAC (Digital to Analog converter) what is purpose of Sample and Hold Circuit and explain its working with suitable figure? **[6]**

b) In Thermal system modelling, explain Thermal capacitance. **[4]**

c) Carry out block diagram reduction for the system shown in figure 2. **[8]**

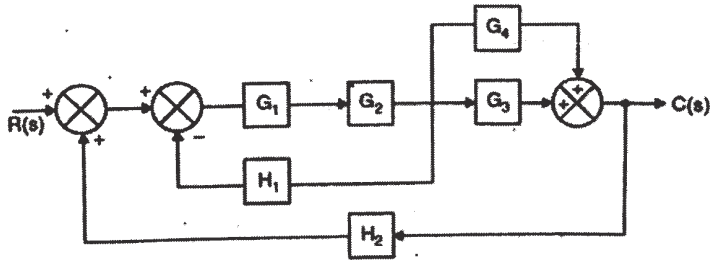

Fig. 2

SECTION - II

Q7) a) Explain feed forward control system with illustrative example. Compare it with feedback control system. **[8]**

b) What is transfer function? Derive the transfer function for closed loop control system. **[8]**

OR

Q8) a) A controlling variable is a motor speed that varies from 800 to 1750 rpm. If the speed is controlled by a 25 to 50 V DC signal, calculate: **[8]**

i) The speed produced by an input of 40 V; and

ii) The speed calculated as a percent of span.

b) Define and explain following process characteristics: **[8]**

i) Process equation

ii) Process load

iii) Process capacity

iv) Dead time

Q9) a) Explain Proportional plus Derivative (PD) control with mathematical expression. Write advantages of applying PD control over proportional (P) applied alone or derivative (D) applied alone. **[8]**

b) Define Proportional control, Proportional Band, and Offset error with relevant mathematical expressions. **[8]**

OR

Q10)a) An integral controller is used for speed control of 12 rpm within a range of 10-15 rpm. The controller output is 22% initially. The constant K_I = -0.15% controller output per second per percent error. If the speed jumps to 14.5 rpm, calculate controller output after 3 seconds for constant e_p. **[8]**

b) "Derivative controllers are not used alone." Justify the statement with respect to some error verses time graph and corresponding controller output verses time graph. **[8]**

Q11)a) Draw a ladder diagram for a two motor system having following conditions: The start switch starts motor 1; and 10 seconds later motor 2 starts, the stop switch stops motor1 and 15 seconds later motor 2 stops.

Write boolean expressions for the rungs. **[10]**

b) Explain the basic structure of PLC with suitable sketch. What are various factors to be considered for selection of PLC. **[8]**

OR

Q12)a) Draw ladder diagram for bottle filling plant for below given sequence.**[10]**

i) Start the conveyor.

ii) When bottle is in position, stop the conveyor and open the solenoid valve.

iii) When bottle is full that is detected by optical proximity switch, close the solenoid valve.

iv) Go to step 1 for next bottle.

Write boolean expressions for the rungs.

b) How relay works? Explain the working principle of electromechanical relay. Explain the advantages of PLC over conventional relay type control. **[8]**

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