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SF-7841

B. E. - IV (Sem. VIII) (Mechanical) Examination

May / June - 2011

Instrumentation & Control

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 4 (SEM. 8) (MECHANICAL)

Name of the Subject :

☛ INSTRUMENTATION & CONTROL

☛ Subject Code No. : 7 8 4 1 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Attempt all the questions.

(3) Figures to the right indicate full marks.

(4) Use of graph paper is allowed.

(5) Assume suitable data if required.

(6) Use of Laplace transform table is not allowed.

1 (a) Explain following term given below (any five) **5**

(i) What are the fundamental components of Electrical system ?

(ii) Define : Peak overshoot

(iii) What is a synchro ?

(iv) Define : Peak time

(v) Write a mathematical expression of Laplace transformation.

(vi) Define : Variance

(vii) What is control system ?

(b) Determine the stability of a closed loop control system whose characteristic equation is **5**

$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$

(c) Write short note on any two of the following : **10**

(i) Mathematical model of thermal system

(ii) Integral controller

(iii) Transfer function

(iv) Mathematical model of pneumatic system

2 (a) Obtain the inverse of Laplace of : **5**

$$F(S) = \frac{3S + 26}{S^2 + 4S + 20}$$

(b) Obtain the solution of differential equation given below: **5**

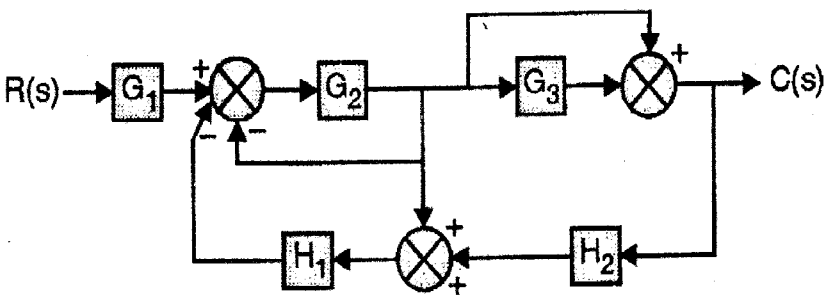
(i) $\frac{d^2x}{dt^2} + 5\frac{dy}{dt} + 6y = 12e'$; given $y(0+) = 0$ and $y'(0+) = 6$

(ii) Explain proportional controller **5**

OR

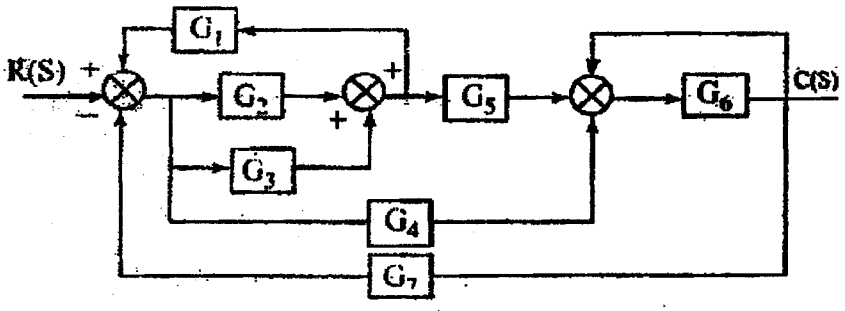
(b) Sketch PID controller. Draw it's block diagram and obtain its transfer function. State merits and limitations of the controller. **10**

3 (a) Using the block diagram techniques, find the closed - loop functions of the following systems. **7**

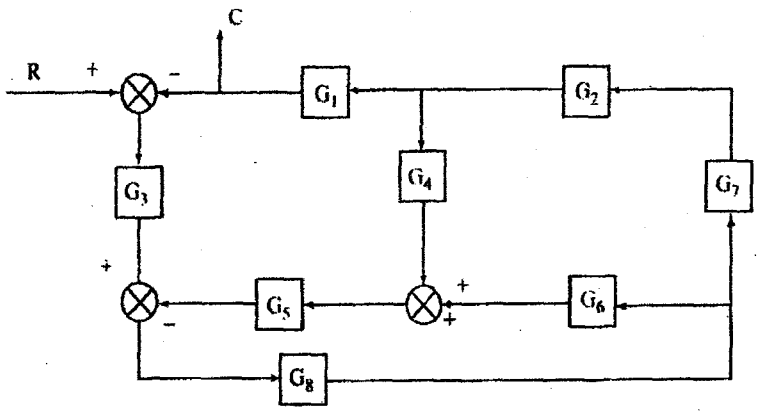


OR

(a) Using the block diagram techniques, find the closed-loop functions of the following systems. 7



(b) Construct an equivalent signal flow graph for the block diagram shown in figure and evaluate the transfer function. 8



4 (a) Explain given below : 5

(i) Difference between primary and secondary transducer

(ii) Piezo-electric effect

(iii) 1st order instrument

(iv) Data acquisition system

(v) Active transducer

(b) Explain major elements and its function of data acquisition and processing system. 10

5 (a) Explain Capacitive transducer. **5**

(b) A Piezo-electric transducer has a capacitance of 1000pF and a charge sensitivity of 0.00040 C/m. The connecting cable has a capacitance of 300pF while the oscilloscope used for readout has a readout input resistance of 1MΩ with a parallel capacitance of 50 pF. **10**

(i) What is the sensitivity of the transducer alone ?

(ii) What is the lowest frequency that can be measured with 5% amplitude error by the entire system ?

(iii) What the high frequency sensitivity of the entire system ?

(iv) What is the value of an external shunt capacitance that can be connected in order to extend the range of 5% error down to 10Hz ?

(v) With external capacitance calculated in (d) connected in the circuit, what is the system high frequency sensitivity ?

6 (a) Discuss the importance of data transmission in the content of modern measurement. **10**

OR

(a) (i) Explain digital display device. **5**

(ii) Write on successive approximation method. **5**

(b) Explain any two : **10**

(i) Hall Effect transducer

(ii) Digital transducer

(iii) LVDT

(iv) A/D converter.
