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SF-8357-N

B. E. III (Sem. VI) (Mech.) Examination

May / June - 2011

Control Engineering

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. - 3 (SEM. 6) (MECH.)**

Name of the Subject :

☛ **CONTROL ENGINEERING**

☛ Subject Code No. : **8 3 5 7** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Figures to the right indicates full marks.
(4) Use of graph paper is allowed.
(5) Use of Laplace transform tables is not-allowed.

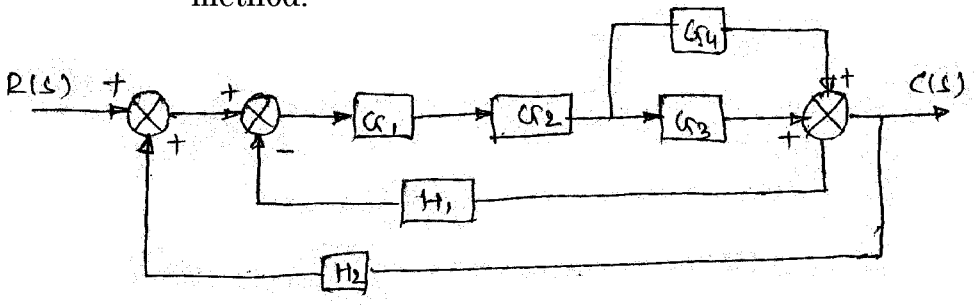
1 (a) Answer the following questions : **10**

(i) Explain control system.
(ii) What is stability ?
(iii) Explain open loop transfer function.
(iv) Properties of Transfer function.
(v) The output of a linear system for a unit step input is given by $t2e^{-t}$. Find the transfer function of the system.

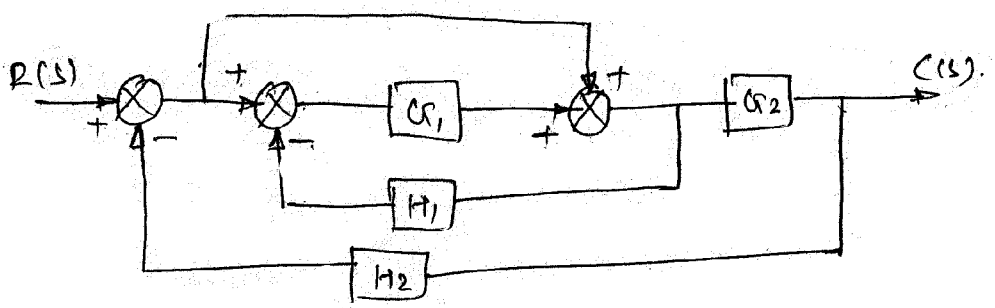
(b) Analysis of first order system for unit step response. **10**

2 (a) Attempt any two : **15**

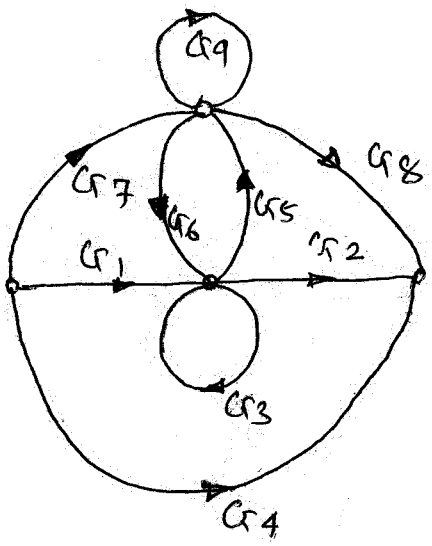
(i) Solve the problem using block diagram reduction method.



(ii) Solve the problem using signal flow graph :



(iii) Find C/R for the following system using Mason's gain formula.



3 (a) Find the range of K for which the system, whose characteristic equation is given below is stable **5**

$F(S) = S^3 + (K+0.5)S^2 + 4KS + 50 = 0$

(b) Draw the root locus for the system **10**

$$G(S) \cdot H(S) = \frac{K}{S(S+3)(S+6)}$$

Obtain the value of K when $\xi = 0.6$

Determine the value of K for marginal stability and critical damping.

OR

(b) Sketch the root locus for transfer function :

$$G(S).H(S) = \frac{K}{(S+2)^3}$$

Find the value of K which gives a damping ratio of 0.5. For K = 8, find the gain margin and phase margin of system.

4 Write short notes : (any **four**) **20**

(a) Pneumatic Relay
(b) Liquid Level Control
(c) Control system in thermal power plant
(d) Control system in Automobiles
(e) Concept of fuzzy logic

5 (a) Derive block diagram and transfer function for speed control of DC motor by Armature Control. 8

(b) Classify hydraulic pumps based on construction. Explain any two with neat sketches. 7

OR

(b) Write short notes on : 7
(i) Hydraulic Ran
(ii) Hydraulic Crane

6 (a) Explain the construction and working of pneumatic amplifier with neat sketch. 8
Derive block diagram and transfer function for the system.

(b) (i) State advantages and disadvantages of pneumatic system over hydraulic system. 4

(ii) Write desirable characteristic of hydraulic fluid. 3

OR

(b) Classify pneumatic valves. Explain 4 way valve and flapped nozzle valve with neat sketches. 7