COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)

END Semester Examination

(ME404) Automatic Control Systems(TH)

Course: B.Tech | Branch: Mechanical Engineering

Semester : Sem VII

Year : 2014-2015 | Max.Marks:60

Duration: 3 Hours Time:- 2:00 to 5:00 p.m. | **Date:22/11/2014**

Instructions: **MIS No.** | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

Q. 1 a) Write a short note on the term " Feedback based Regulating System " ? Explain this term with the help of suitable block diagram. State all the possible applications in various fields and explain any one with specific details. [05]

OR

a) Explain the basic definition of "System" and "control system". Also discuss a "Need of Control Systems" for advanced process plants and devices. Explain these examples with self explanatory relevant information. [05]

b) Write a short note for **any one** of the following terms. [05]

i) Control system types as A] deterministic & stochastic and B] SISO & MIMO
ii) Laplace Transform for relating the time function to frequency dependent function.
iii) Derivation of the roots of the characteristics equation and its significance.

Q. 2 a) Justify **any one** of the following statements. [05]

1) Adjustments of the forward path gain can cause changes in the transient response.
2) With three different approaches mathematical modeling of control system is possible.
3) The transfer function for mechanical networks looks identical to transfer functions for electrical networks

b) Reduce the block diagram of system as shown in Fig. 1 to a single transfer function. [05]

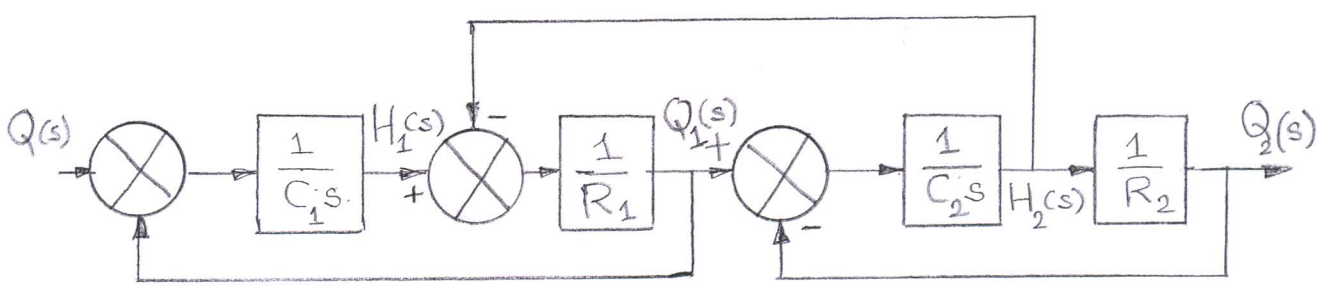

Fig. 1

(P.T.O.)

Q. 3 a) Write only the names of various types of Hydraulic direction control valves & flow control valves. Explain any two of each type (directional and control) with the help of suitable sketches. [05]

OR

a) Elaborate the use of fly ball governor integrated with hydraulic actuator to use it for integral control system. Draw the block diagram and circuit diagram of such system. [05]

b) Draw the Bode plot for the transfer function as given below. (Draw an appropriate semi-log graph on the answer sheet for the construction of the plot.) [07]

$$G(s) = K s^2 / (1 + 0.2 s)(1 + 0.02 s)$$

Determine the value of K for the gain cross-over frequency to be 5 rad/sec.

c) Explain the significance of the Nyquist Stability criterion. Also explain that how it can be helpful for improving the system performance by reshaping the polar plot. [08]

Q. 4 Write a short note on **any four** of the following. [20]

1) Analyze RLC series & parallel circuits by using of Kirchoff's voltage & current laws.
2) Principal of operation and the application of AC servo motor.
3) The classification of Pumps & discuss any two types of positive displacement pumps.
4) The unit step response of a second order system and its features.
5) PI controller – working principal, circuit dia., merits, demerits & applications.
6) Rouths Stability Criterion.

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