Mechanical

COLLEGE OF ENGINEERING, PUNE – 5.

End Semester Examination

(ME 404)   Automatic Control System

Programme :- B.Tech. (Mechanical)   Date :- 27th Nov 2012
Specialisation :- Mechanical   Max. Marks :- 50
Year :- 2012 – 13   Duration :- 03 hr

Instructions: - 1) Figures to the right indicate full marks
                     2) Draw neat figures wherever required

Q.1 a) What are the basic definition of the "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) What do you understand by the term " Feedback based Regulating System " ? Explain this term with the help of suitable block diagram. State all the possible applications of it in various fields and explain any one with specific details.   [05]

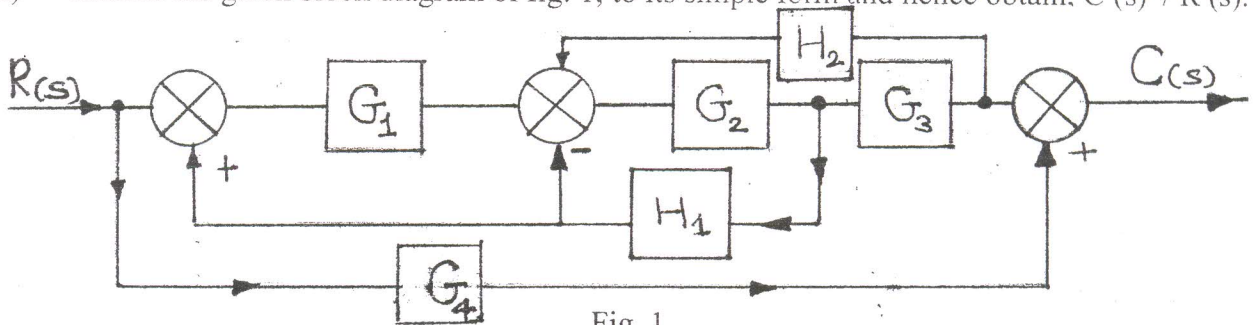Q.2 a) Reduce the given block diagram of fig. 1, to its simple form and hence obtain. C (s) / R (s).   [05]

Fig. 1

OR

a) Obtain the Transfer function for the system as shown in the fig. 2, using Mason's gain formula.

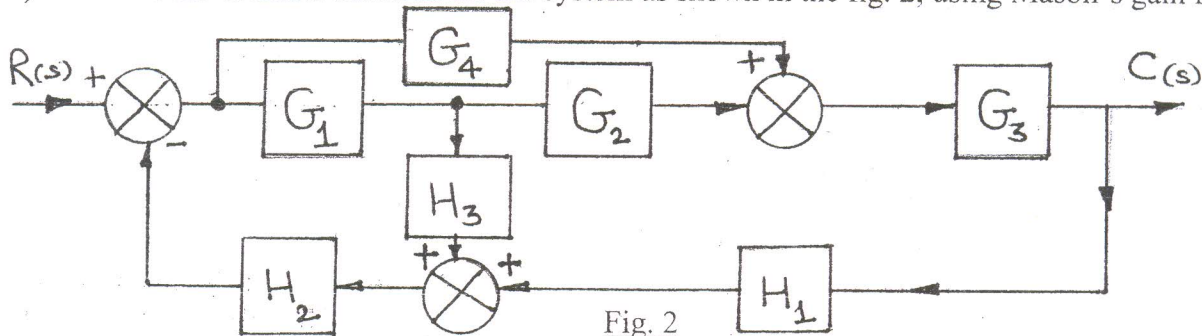[05]

Fig. 2

b) Draw the signal flow graph for the block diagram given in the fig. 3 and obtain the transfer function for the same system.   [05]
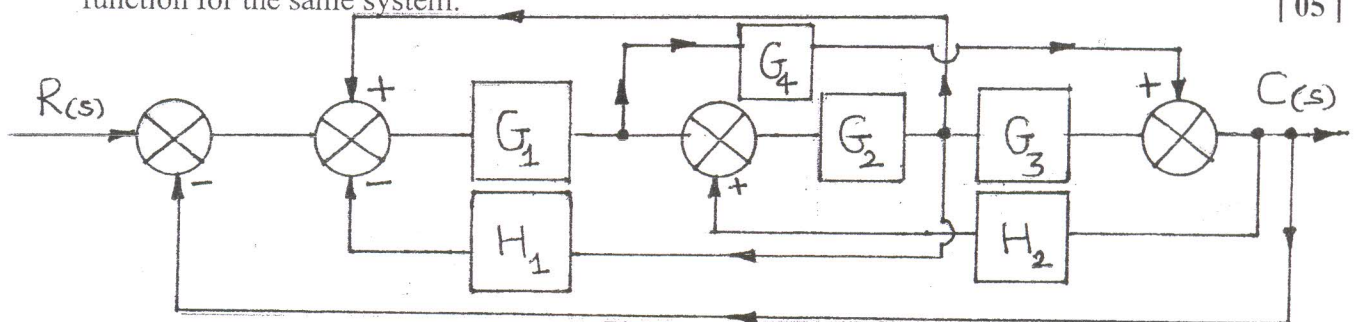

Fig. 3

(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) Explain principal of operation and the application of the Hydraulic Copying attachment with the help of suitable sketch. Explain the effective use or known application of this system for any automated process.
[05]

b) Explain the principal of operation of Stepper Motor for its application in the electrical systems to be used for controlling? Also explain the reasons of its preferential use in the peripheral devices and non suitability for the various other types of control applications.
[05]

Q. 4 a) Explain the systematic steps of obtaining the Bode Plot with the help of suitable examples and the necessary details.
[05]

OR

a) Draw the Bode plot for the transfer function as given below.(Draw semilog graph on the answer sheet)
[05]

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

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

b) 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.
[05]

Q. 5 Write a short note on **<u>any two</u>** of the following.
[10]

1) Equations of operation for the mechanical & electrical system using direct & Inverse analog.
2) Fly ball governor integrated with hydraulic actuator to use it for integral control system.
3) PI controller – working principal, circuit dia., merits, demerits & applications with help of suitable sketch, equations and the performance-time variant graph.
4) Concept of stability and Rouths Stability Criterion.
5) The applications, scope and control of Flapper – Nozzle system.

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