

**SUBJECT CODE NO: E-239**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**B.E.(MECH] Examination Nov/Dec 2017**  
**Automatic Control System**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

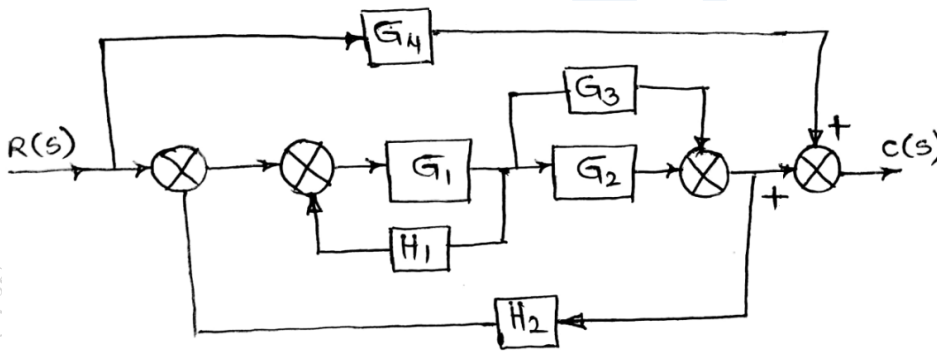
Please check whether you have got the right question paper.

N.B

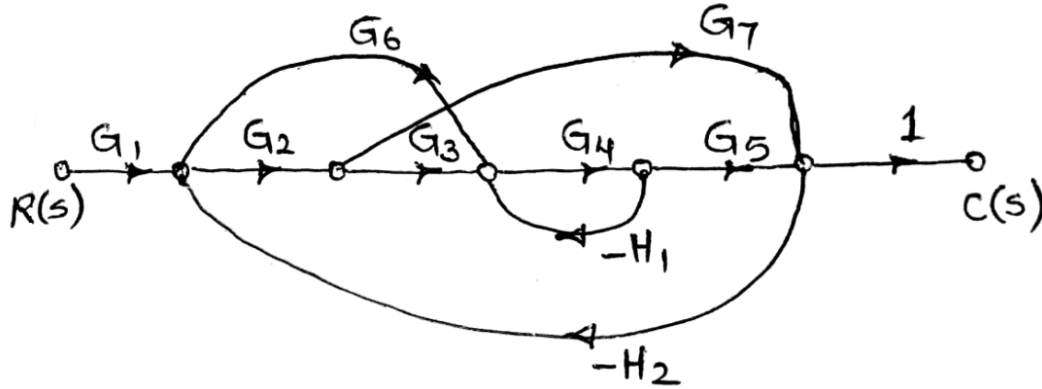
- i) Solve any three questions from each section.
- ii) Draw neat sketches if required.
- iii) Assume suitable data, if necessary.

Section A

- |     |  |    |
|-----|--|----|
| Q.1 | a) What is Control System? Explain the generalised control system with a block diagram.      | 07 |
|     | b) What are the advantages of an Automatic Control System?                                   | 06 |
| Q.2 | a) Explain in detail Force Current analogy.  | 07 |
|     | b) Explain the concept of Grounded chair representation.                                     | 06 |
| Q.3 | a) Determine the transfer function for the system represented by block diagram shown in fig. | 07 |



- |     |  |    |
|-----|--|----|
|     | b) Write a short note on Electrical System.                      | 06 |
| Q.4 | a) Find the transfer function of the system shown by SFG in fig. | 07 |



b) Explain ON/OFF Control action with an example.

06

Q.5 Write short notes on (any two)

14

- Proportion Controller
- AC Servomotor
- Pneumatic Controllers

### Section B

Q.6 a) What is the need of reference test signals. Explain any two reference test signals in detail. 07

b) Prove that the response of second order system when subjected to unit step input is,  
 $c(t) = 1 - e^{-\omega_n t} (1 + \omega_n t)$

06

Q.7 a) Given the T.F,  $G(S) = \frac{81}{s^2 + 9s + 81}$  find the rise time, % Overshoot,  $T_p$  and  $T_s$ .

07

b) Define the following terms (1) Second order system (2) Natural frequency of Oscillation (3) Damping ratio

06

Q.8 a) Explain the concept of phase & gain margin.

06

b) Determine the stability of  $S^6 + 3S^5 + 9S^4 + 18S^3 + 27S^2 + 36S + 45$

07

Q.9 a) For the unity feedback Control system 09  
 $G(S) = \frac{10}{s(s+2)(s+10)}$  Sketch the bode plot and determine the gain & phase margin.

b) Write down the importance of Semilog paper. 04

Q.10 a) Draw the Root Locus for the following system. 10  
 $G(S). H(S) = \frac{K}{s(s+5)(s+7)}$

b) Write down the advantages of MATLAB software for Control System. 04