

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO/2022)**

CLASS: BTECH
BRANCH: ECE

SEMESTER : V
SESSION : MO/2022

SUBJECT: EC307R CONTROL SYSTEMS

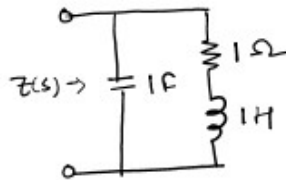
TIME: 03 Hours

FULL MARKS: 50

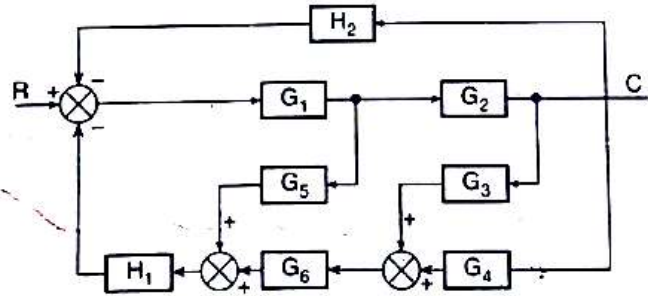
INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

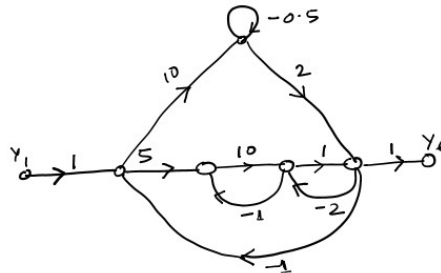
- Q.1(a) With suitable diagram explain the effects of feedback on stability of the system [2]
 Q.1(b) List the major advantages and disadvantages of open loop control system [3]
 Q.1(c) Obtain the poles and zeros for the driving point function $Z(s)$ of the following circuit. [5]



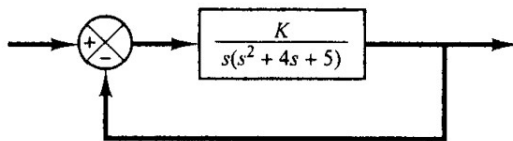
- Q.2(a) Reduce the block diagram shown in figure using block diagram reduction method and find out C/R. [5]



- Q.2(b) Using Mason's gain formula determine the overall gain of Y_6 / Y_1 . [5]



- Q.3(a) Derive the expression of time response of a second order system when it is subjected to unit step input. Find out the steady state error. [5]
 Q.3(b) Sketch the root loci of the system shown in figure below [5]



- Q.4(a) Write down the transfer function of the PID controller. Specify all the parameters involved in it. [2]
 Q.4(b) Draw the block diagram of the LTI control system represented in state space. Write down the state equation [3]

Q.4(c) Find out the A B C D parameters of the system whose transfer function is given as [5]

$$\frac{Y(s)}{U(s)} = \frac{s}{(s + 10)(s^2 + 4s + 16)}$$

Q.5(a) Explain how the stability can be determined using Bode plot? [2]

Q.5(b) Draw the Nyquist plot for the system whose loop gain is [3]

$$L(s) = \frac{20}{s^3 + 5s^2 + 6s}$$

Q.5(c) Draw the bode plot for the system whose loop gain is [5]

$$G(s)H(s) = (5s+10)/(s^2+ 10s)$$

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