PROD/VIII/CBGS/A&CE | 18-05-2017

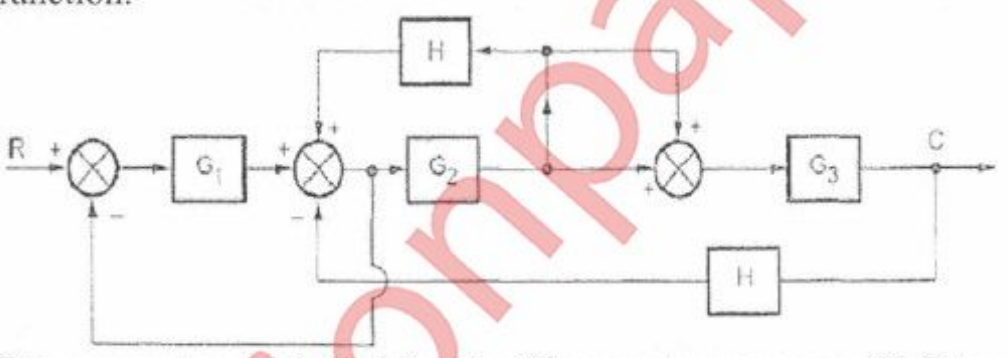
Automation & Control Engg **Q.P. Code : 800001**

(3 Hours) **[Total Marks : 80]**

NB: 1) Question No.1 is compulsory.
2) Answer any 3 questions out of the remaining questions.
3) Assume suitable data if necessary.

1. **Write Short notes on the following :-** **20**
(a) Automation Principles and Strategies
(b) Servo Hydraulics
(c) Proximity Sensors
(d) Open and Closed loop Control System

2. (a) Reduce the following block diagram and obtain the simplified transfer function. **10**



(b) **10**
Draw a neat and labelled Ladder Diagram to program a PLC to execute the sequence A+, B+, A-, B-, continuously until a stop button is pressed; given that cylinder 'A' is controlled by a double solenoid valve and cylinder 'B' is controlled by a single solenoid valve. Also, show the allocation *I* assignment list.

3. (a) Using Routh's Criterion, examine the stability of a system with characteristic equation: **06**
$s^5 + 2s^4 + 3s^3 + 6s^2 + 2s + 1 = 0$

(b) Draw the approximate root locus diagram for a closed loop system whose loop transfer function is given by the following and also comment on its stability **14**

$$G(s)H(s) = \frac{K}{s(s+5)(s+10)}$$

4. (a) Design and Draw a Pneumatic control circuit for the following sequence using cascade method. **15**
C- (B+A-) / B- C+ / (A+C-) / dwell C+

[TURN OVER]

(b) Explain in Brief, 'Dominant on' and 'Dominant off' latch. **05**

5. (a) Design and Draw an Electro-pneumatic control circuit for the following sequence using double solenoid valves and groups. **14**
A+ B+ / (B-C+) / C- delay A-

(b) Determine the departure and arrival angles at complex poles and zeros for. **06**

$$G(s)H(s) = \frac{K(s^2 + 3s + 10)}{s(s+2)(s^2 + 2s + 101)}$$

6. (a) A unity feedback control system has **14**

$$G(s) = \frac{10}{s(s+1)(s+5)}$$

Draw the Bode Plot. Determine G.M. P.M. ω_{gc} and ω_{pc}. Comment on the stability.

(b) For the inputs, a, b, c and output Y, the equation for an 'OR' logic operation is as below, **06**

$Y = \bar{a}\,\bar{b}\,\bar{c}\ V\ a\,\bar{b}\,\bar{c}\ V\ \bar{a}\,\bar{b}\,c\ V\ a\,\bar{b}\,c$

Using K. Map, simplify this equation and draw the circuit diagram.

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