Q. P. Code: 27160

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

N.B. (1) Question no.1 is compulsory

(2) Answer any 3 questions out of the remaining questions.

(3) Assume suitable data if necessary.

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

Q.2. (a) State the rules used for Block diagram reduction. What are the advantages and disadvantages of block diagram? 10

(b) 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 / assignment list. 10

Q.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

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

Q.4. (a) Design and Draw a Pneumatic control circuit for the following sequence using shift register method. 15
(A+B+) / delay B- C+ / (AC)- B+ / B-

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

Q.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

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

Q.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, d and output Y, the equation for an 'OR' logic operation is as below, 06

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

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

****