

- N.B. (1) Question No. 1 is compulsory.  
 (2) Solve any **four** from remaining **six** questions.  
 (3) Assume **suitable** data if **required**.



1. Explain the following (any **four**) :— 20  
 (a) Stepper motor (d) Polar plot  
 (b) Servo mechanism (e) PID controller.  
 (c) Open loop and Closed loop
2. (a) Compare :— 10  
 (i) Linear and Non-linear system  
 (ii) Hydraulic motor and Electric motor.  
 (b) Develop Electro Hydraulic circuit for the given sequence :— 10  
 A<sup>+</sup>, (Delay), B<sup>+</sup>, A<sup>-</sup>, Dealy, B<sup>-</sup>.
3. (a) Explain the block diagram of PLC. Develop the ladder logic for the bottle filling plant. 10  
 (b) Explain successive approximation A/D convertor. 10
4. (a) Define the following :— 10  
 (i) Bandwidth (iv) Gain margin  
 (ii) Gain crossover frequency (v) Phase margin.  
 (iii) Phase crossover frequency  
 (b) A feedback system has T.F. 10  

$$G(s)H(s) = \frac{100(s+4)}{s(s+0.5)(s+10)}$$
 Draw Bode plot. Comment on stability.
5. (a) Write a program to generate a square wave by using microcontroller. 10  
 (b) A unity feedback system has — 10  

$$G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$$
 Determine type of system, all error coefficients, error for Ramp input with magnitude 4.
6. (a) The closed loop T.F. of the lathe machine is given by — 10  

$$T(s) = \frac{k}{s^4 + 6s^3 + 30s^2 + 60s + k}$$
 Determine the range of k.  
 (b) Two double acting pneumatic cylinder A, B are selected for industrial Application. 10  
 The sequence is Delay, (AB)<sup>+</sup>, Delay, A<sup>-</sup>, Delay, B<sup>-</sup>. Draw electro pneumatic circuit.
7. (a) For a unity feedback system — 10  

$$G(s) = \frac{k}{s(s+4)(s+2)}$$
 Sketch root locus showing all details on it and comments on stability.  
 (b) For a control system shown in **figure**. Find the values of  $k_1$  and  $k_2$  so that 10  
 $M_p = 25\%$  and  $T_p = 4$  sec. Assume unit step input.

