

## Sample Test Paper-I

Course Name : Electronics engineering group

Course Code : ET/EN/EX/EJ/DE/ED/EJ

17536

Semester : Fifth

Subject Title : Control system and PLC

Marks : 25

Time: 1 hour

**Instructions:**

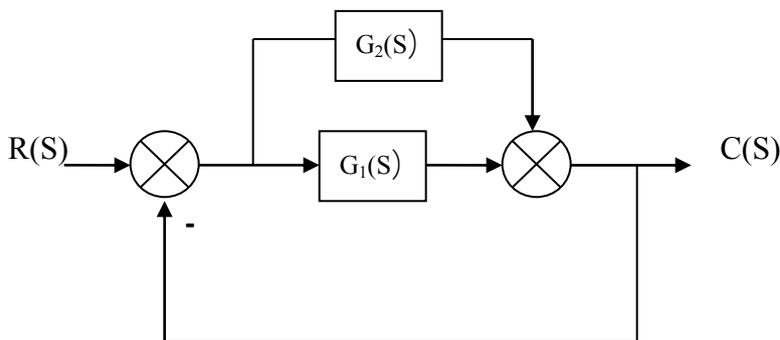
1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

**Q1. Attempt any Three****09 Marks**

- a) Define i) Transfer function ii) Order of the system
- b) Compare open loop and closed loop systems based on BD, TF and examples.
- c) Find out the poles and zeros of the following TF and show them in the S-plane.  
TF=  $6(S+9)/S(S^2+5S+6)$
- d) List the standard test input signals. Write their Laplace representations.

**Q2. Attempt any Two****08 Marks**

- a) Find out the TF of the following block diagram



- b) Determine the stability of the system using Routh's criterion with characteristic equation  $S^4+4S^3+S^2+8S+1=0$
- c) Define marginally stable system. Draw the location of poles and response of such a system.

**Q3. Attempt any Two****8 Marks**

- a) Find out the value of  $e_{ss}$  of unit feedback system with  $G(S)=200/S(S+5)(S+10)$  for  $r(t)=5t$
- b) If the system differential equation is  $d^2y/dt^2+10dy/dt+25y=25x$ ,  $y(t)=o/p$ ,  $x(t)=i/p$  find out the value of  $w_n$ ,  $w_d$ ,  $\epsilon$ .
- c) Define servo system. Draw the standard block diagram of it.

Scheme - G

## Sample Test Paper-II

Course Name : Electronics engineering group

Course Code : ET/EN/EX/EJ/DE/ED/EJ

17536

Semester : Fifth

Subject Title : Control system and PLC

Marks : 25

Time: 1 hour

### Instructions:

1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

### Q1. Attempt any Three

09 Marks

- a) Define w.r.to controllers. i. neutral zone, ii. offset error, iii. proportional Band
- b) Describe the role of PLC in automation.
- c) Give the specification for the PLC based on following:
  - i. Name of PLC (manufacture)
  - ii. Type of PLC
  - iii. Number of Input and Outputs.
- d) Draw the labeled block diagram of process control system.

### Q2. Attempt any 2 of the following

8 Marks

- a) State the reason: derivative control system is known as rate controller. Why is it not used alone?
- b) Describe in brief memory organization of PLC
- c) Draw the block diagram of AC input module of PLC.

### Q3. Attempt any 2 of the following

8 Marks

- a) Compare proportional and integral controller on the basis of equation, advantages, Response to error, application
- b) Draw and explain block diagram of PLC DC power supply
- c) List any four Compare and Logical instructions each of PLC.

**Scheme - G**  
**Sample Question Paper**

**Course Name : Electronics engineering group**

**Course Code : ET/EN/EX/EJ/DE/ED/EJ**

**17536**

**Semester : Fifth**

**Subject Title : Control system and PLC**

**Marks : 100**

**Time: 3 hours**

**Instructions:**

1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

**Q1 A) Attempt any Three**

**12**

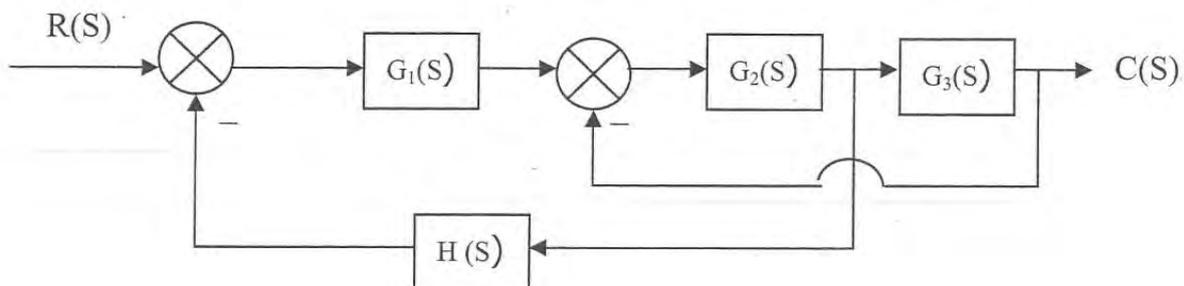
**Marks**

- a) Define stable and unstable system and locate their poles on s-plane.
- b) Name any four I/P and O/P devices each used with PLC.
- c) Differentiate between linear and nonlinear control systems
- d) Classify the different modes of process control actions.

**Q1 B) Attempt any One**

**06 Marks**

- a) State w.r.t PLC i. System memory. Ii. Application memory iii. Program files iv. Data files
- b) Derive the transfer function of the following block diagram



**Q2. Attempt any Two**

**16**

**Marks**

- a) For a unity feed back system, the open loop TF  $G(S) = \frac{25}{s(s+6)}$  find out i) rise time, ii) peak time, iii) max. Overshoot, iv) settling time.
- b) A unity feedback system has  $G(S) = \frac{10(S+1)}{s^2(s+2)(s+10)}$ . Find out i) Type of the system and Static error coefficients  $K_p, K_v, K_a$  ii) Steady state error for input  $r(t) = 1+4t+t^2/2$

- c) Draw Ladder diagram for 2 motor operation for following conditions: i) Start push button starts motors  $M_1$  and  $M_2$  ii) Stop push button stops motor  $M_1$  first and after 10 seconds motor  $M_2$

**Q3. Attempt any Four**

**16 Marks**

- a) Derive the Transfer function of RLC network.  
 b) Draw labelled block diagram of PLC and explain each block in brief.  
 c) Derive the expression of TF of closed loop system  
 d) Find out the range of K for the given system to be stable with  $G(S)H(S) = \frac{K}{S(S+4)(S^2+2S+2)}$   
 e) Describe the term redundancy in PLC.

**Q4. A. Attempt any Three**

**12 Marks**

- a) Describe Derivative control action with its equation and response to error. State its any one advantage & disadvantage each.  
 b) Describe the classification of I/O modules in PLC  
 c) Differentiate between Fixed PLC and Modular PLC  
 d) Derive the Laplace representation of steady state error.

**Q4 B. Attempt any One**

**06 Marks**

- a) Describe the wiring details of AC input module of PLC.  
 b) Describe PI control action w.r.t equation and response to error. State one advantage and one disadvantage of it.

**Q5. Attempt any Two**

**16 Marks**

- a) i) Describe sinking and sourcing concept in DC input modules of PLC  
 ii) Draw the BD of AC discrete input module of PLC.  
 b) i) Draw the effect of Damping on the response of a second order system.  
 ii) Define time constant. Show its effect on system response with diagram.  
 c) Consider the system with characteristic equation  $S^5 + S^4 + 2S^3 + 2S^2 + 3S + 5 = 0$ . Determine stability of the system using Routh's criteria

**Q6. Attempt any Four**

**16 Marks**

- a) Define offset. State three methods to eliminate it  
 b) State Routh's stability criteria describe different cases to find stability of a system.  
 c) Write the Ladder diagram to measure frequency using timer and counter.  
 d) Describe ON-OFF control action with equation and response curve. Define neutral zone.  
 e) Define servo system. Draw and label the Functional block diagram of DC servo system.