

T.Y. Diploma : Sem. V
[ET/EN/EX/EJ/DE/ED/EI]
Control System & PLC
Prelim Question Paper



Time: 3 Hrs.]

[Marks : 100

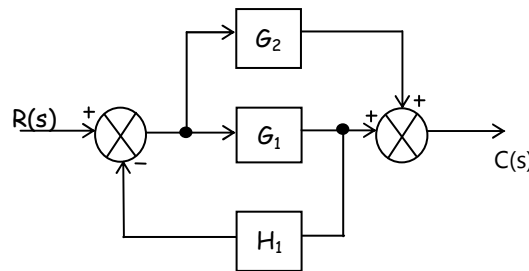
- Instruction :** (1) All Questions are compulsory.
 (2) Illustrate your answers with neat sketches wherever necessary.
 (3) Figures to the right indicate full marks.
 (4) Assume suitable data, if necessary.
 (5) Use of Non-programmable Electronic Pocket Calculator is permissible.

1. (a) Attempt any **THREE** of the following : [12]

- (i) Consider a system with characteristic equation
 $S^5 + 2S^4 + 2S^3 + 4S^2 + 11S + 10 = 0$
 Determine stability using Routh's criteria.
 (ii) Give the classification of PLC. Explain modular PLC in brief.
 (iii) Compare open loop and closed loop control system (four points).
 (iv) Draw electronic PID controller and state its equation.

1. (b) Attempt any **ONE** of the following : [6]

- (i) State with respect to PLC :
 (1) Scanning Cycle &
 (2) Speed of execution
 (ii) Using block diagram reduction technique, obtain T.F. of the block diagram.



2. Attempt any **TWO** of the following : [16]

- (a) Find K_p , K_v , K_a & steady state error for a system with open loop transfer function as

$$G(S) H(S) = \frac{10(S+2)(S+3)}{S(S+1)(S+4)(S+5)}$$

Where input $r(t) = 3 + t + \frac{t^2}{2}$

- (b) A unity feedback system has

$$G(S) = \frac{16}{S(S+5)}$$

If a step input is given, calculate (i) rise time, (ii) peak time, (iii) maximum overshoot, (iv) settling time.

- (c) Draw ladder diagram to verify following logic gates truth table :

(i) NAND gate (ii) EXOR gate (iii) NOR gate (iv) AND gate

3. Attempt any **FOUR** of the following : [16]

- (a) Compare linear and non-linear system (four points).
 (b) Explain the functions of output module of PLC.
 (c) Draw neat sketch of unit step response of a second order system with neat labeling.
 (d) Derive an expression for T.F. of closed loop system.
 (e) Explain memory organization of PLC.

4. (a) Attempt any **THREE** of the following : [12]
- (i) Differentiate between Fixed & Modular PLC.
 - (ii) List any four specifications of AC input module.
 - (iii) State the principle of ON-OFF control action. Write its standard equation and define neutral zone.
 - (iv) Write the Laplace transform for the following input signal.
 (1) step (2) ramp (3) parabolic (4) impulse
4. (b) Attempt any **ONE** of the following : [6]
- (i) List types of control actions. Give its output equation and corresponding laplace transforms.
 - (ii) Compare PL, PD and PID controller (four points).
5. Attempt any **TWO** of the following : [16]
- (a) Draw the ladder diagram for 2 motor operation :
 - (i) When start button is pushed motor M1 and M2 start.
 - (ii) After 10 sec. motor M1 stops.
 - (iii) Motor M2 stops 15 sec. after motor M1 has stopped.
 - (iv) Both M1 and M2 will stop when stop push button is pressed.
 - (b) Explain Analog input module.
 - (c) State Advantage & Disadvantage of Routh Array
6. Attempt any **FOUR** of the following : [16]
- (a) Why 'D' control action is not used alone? Justify.
 - (b) State Routh's criteria. Describe different cases to find stability of system (any two).
 - (c) With the help of neat diagram explain the concept of sourcing and sinking DC input module of PLC.
 - (d) Define : (i) Linear and Non-linear system.
 (ii) Time varying and Time in-varying system.
 - (e) Draw electronic PD-controller. State its equation. Explain PD controller in brief.

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T Y Diploma Sem-V: Paper Discussion Schedule

Branches	Date	Day	Timing	Centres
Electronics Group	8 Nov. 2018	Thursday	9 a.m. to 11 a.m.	Dadar
	8 Nov. 2018	Thursday	12 noon to 2 p.m.	Thane