

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA ENGINEERING – SEMESTER – IV • EXAMINATION– SUMMER • 2015

Subject Code: 3341701**Date: 01-05-2015****Subject Name: Control Instrumentation System****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

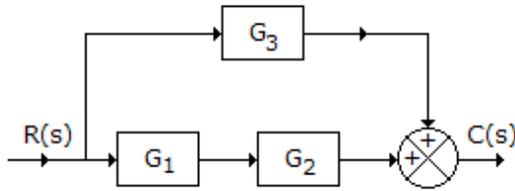
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. English version is considered to be Authentic.

Q.1

Answer any seven out of ten.

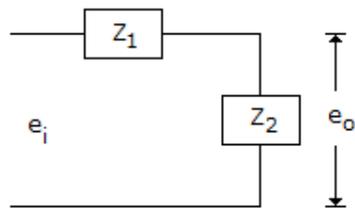
14

1. Whether a linear system is stable or unstable that it
 - A. is a property of the system only
 - B. depends on the input function only
 - C. both (a) and (b)
 - D. either (a) or (b)
2. Mechanical impedance is the ratio of
 - A. rms force to rms velocity
 - B. rms force to rms displacement
 - C. rms velocity to rms displacement
 - D. none of the above
3. For a first order system having transfer function $\frac{1}{1 + sT}$, the unit impulse response is
 - A. $e^{-t/T}$
 - B. $T e^{-t/T}$
 - C. $\frac{1}{T} e^{-t/T}$
 - D. $T^2 e^{-t/T}$
4. In an integral controller
 - A. the output is proportional to input
 - B. the rate of change of output is proportional to input
 - C. the output is proportional to rate of change of input
 - D. none of the above
5. In Bode diagram (log magnitude plot) the factor $\frac{1}{j\omega}$ in the transfer function gives a line having slope
 - A. -20 dB per octave
 - B. -10 dB per octave
 - C. -10 dB per decade
 - D. -20 dB per decade
6. The polar plot of a transfer function passes through (-1, 0) point. The gain margin is
 - A. zero
 - B. -1 dB
 - C. 1 dB
 - D. infinite
7. For the system in the given figure, the transfer function $C(s)/R(s)$ is



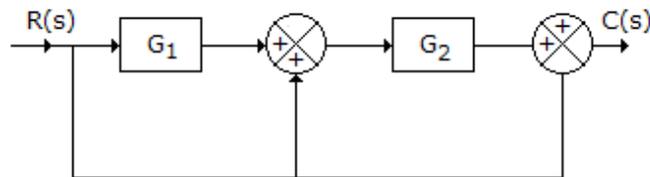
- A. $G_1 + G_2 + G_3$
 - B. $G_1 G_2 + G_3$
 - C. $G_1 G_2 G_3$
 - D. $(G_1 + G_2) G_3$
8. In control systems the magnitude of error voltage
- A. is very small
 - B. is very large
 - C. neither small nor large
 - D. may be any value from 0 to 50 V
9. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is
- A. stable
 - B. unstable
 - C. limitedly stable
 - D. either (a) or (c)
10. In a second order system, the time constant t of exponential envelopes depends
- A. only on damping factor
 - B. only on natural frequency
 - C. both on damping factor and natural frequency
 - D. neither on damping factor nor on natural frequency

Q.2 (a) For the system of the given figure the transfer function $E_o(s)/E_i(s) =$ **03**

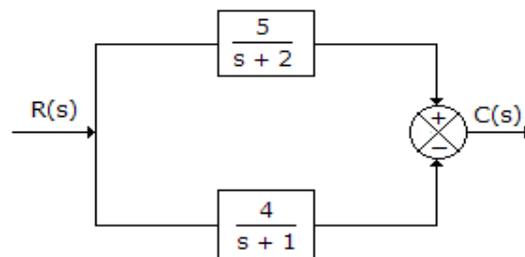


OR

(a) For the system in the given figure, find out transfer function $C(s)/R(s)$ **03**

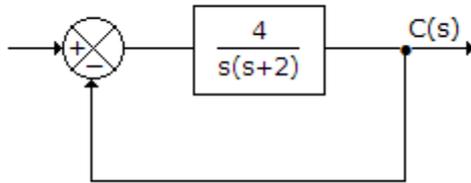


(b) For the given figure determine transfer function $C(s)/R(s)$ **03**



OR

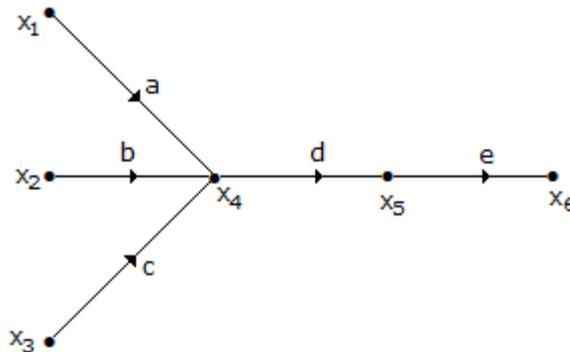
(b) For the system of the given figure, calculate the damping ratio of closed loop poles **03**



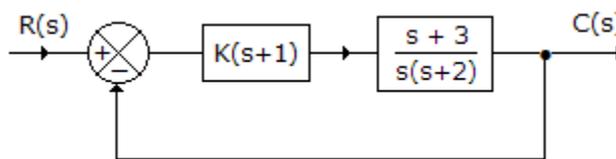
- (c) A unity feedback system has open loop transfer function $\frac{2s + 1}{s^2}$. Find out its closed loop transfer function **04**

OR

- (c) In the given figure find out X_6 . **04**

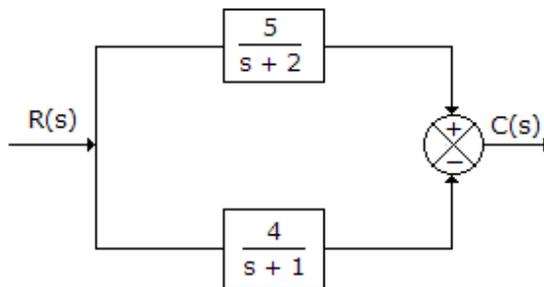


- (d) For the system in the following given figure find out the characteristic equation **04**



OR

- (d) The system of the given figure has how many poles and zeroes and in which planes? **04**



- Q.3** (a) State necessary conditions for stability. **03**

OR

- (a) State Routh-Hurwitz Criteria for stability. **03**

- (b) Explain steady state error briefly. **03**

OR

- (b) Explain Bode Plot in brief. **03**

- (c) Explain servo position control system. **04**

OR

- (c) Explain steady state error constants briefly. **04**

- (d) Draw time response of first order system for step input. **04**

OR

- (d) Define the following terms. **04**
1. Delay time
 2. Rise time
 3. Peak time
 4. Settling time
 5. Steady state error.
- Q.4** (a) Sketch output for P+I control action for step input. **03**
- OR
- (a) Sketch output for P+I+D control action for step input. **03**
- (b) Determine the stability of control system given by characteristics equation **04**
- $$q(s) = S^5 + 1.5S^4 + 2S^3 + 4S^2 + 5S + 10 = 0$$
- OR
- (b) Describe concept of Nyquist stability criteria in brief. **04**
- (c) Define the following. **07**
1. Plant
 2. Process
 3. System
 4. Control system
 5. Servo system
 6. Open loop control system
 7. Closed loop control system.
- Q.5** (a) State the rules for construction of Root Locus. **04**
- (b) Define gain margin and phase margin. **04**
- (c) Define feed forward, cascaded control, and Ratio control system. **03**
- (d) Describe concept of Polar plot in brief. **03**
