15. (a) Explain how controllability and observability for a system can be tested, with an example.

Or

(b) Write the explanatory notes on open loop and closed loop sampled data systems.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 23449

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fourth Semester

Electronics and Communication Engineering

EC 2255 – CONTROL SYSTEMS

(Regulations 2008)

[Common to PTEC 2255 – Control Systems for B.E. (Part–Time) Third Semester – ECE – Regulations 2009]

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the transfer function of the network given in fig. 1.

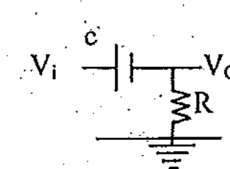


Fig. 1.

2. Compare between open loop and closed loop systems.

3. What are the units of K_p, K_v and K_a?

4. What is the effect of PI controller on the system performance?

5. What is meant by 'Corner frequency' in frequency response analysis?

6. What is Nichols chart?

7. State Routh-Hurwitz stability criterion.

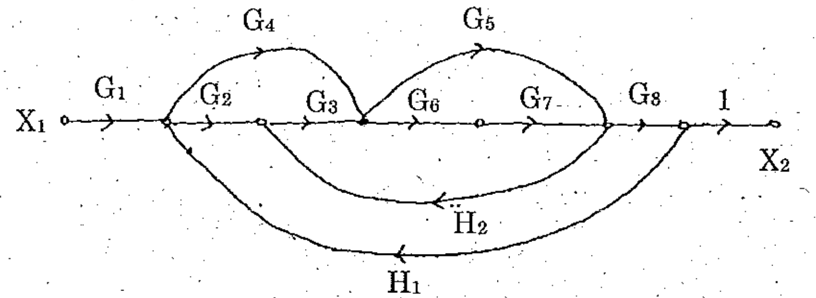
8. List any two advantages of Nyquist stability criterion.

9. Define Nyquist stability criterion.

10. What is gain margin and phase margin?

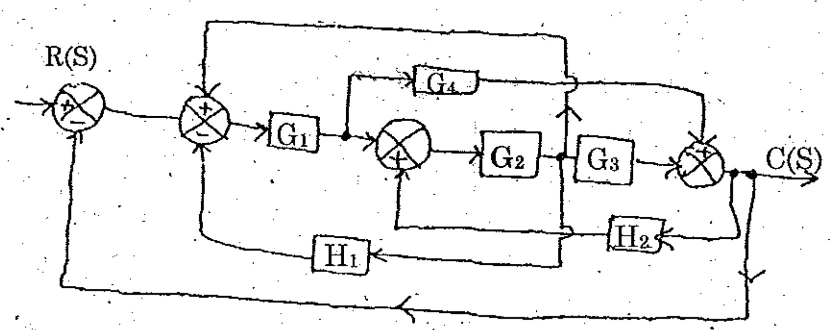
PART B — (5 × 16 = 80 marks)

11. (a) State Mason's Gain formula using Mason's Gain formula to find $\frac{X_2}{X_1}$



Or

(b) Use Mason's Gain formula to obtain C(S)/ R(S) of the system shown below.



12. (a) (i) For the system shown in figure 12(a)(i) find the error using dynamic error coefficient method for input $r(t) = 5 + 4t + 7t^2$. (10)

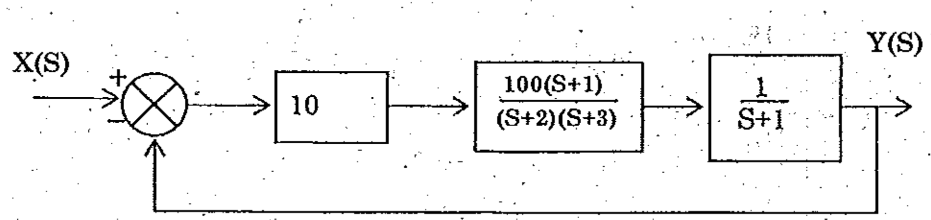


figure 12(a)(i)

(ii) Briefly discuss about transient response specifications. (6)

Or

(b) (i) For the system shown in fig. 12(b)(i) find the effect of PD controller with Td 1/10 on peak overshoot and settling time when it is excited by unit step input (10)

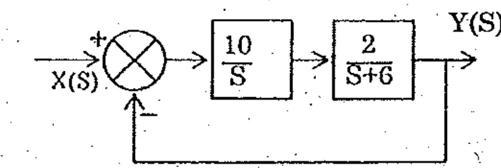


fig. 12(b)(i)

(ii) Discuss the effect of PI controller in the forward path of a system. (6)

13. (a) A robotic arm has a joint control loop transfer function $G_C(s)G(s) = \frac{300(s+100)}{s(s+10)(s+40)}$ Prove that the frequency equals 28.3 rad/s when the phase angle is –180°. Find the magnitude at that frequency.

Or

(b) Derive the transfer function of the compensating network and the type of compensation given in Fig. 13 (b) and draw the Bode plot.

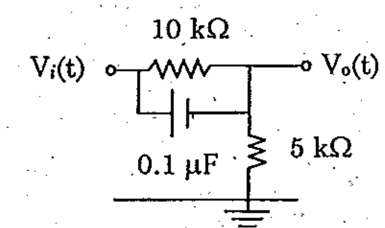


Fig. 13 (b)

14. (a) Draw the root locus plot of a unity feedback system represented by $G(s)K = (s+1)/S^2(s+9)$

For the positive values of 'K'. (16)

Or

(b) For the feedback system whose open loop transfer function is, $G(s)H(s) = K/s(s+3)(s+5)$, investigate the stability of the system for various values of 'K' using Nyquist stability criteria. (16)