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

Question Paper Code : 80317

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Robotics and Automation Engineering

RO 8401 — AUTOMATIC CONTROL SYSTEMS

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between open loop and closed loop system.
2. Write the masons gain formula.
3. Define damping ratio.
4. State transient and steady state response.
5. Describe about all pass system.
6. Specify the frequency domain specifications.
7. Define BIBO stability.
8. What is meant by auxiliary polynomial?
9. What is a Dominant pole?
10. Define state variable.

PART B — (5 × 13 = 65 marks)

11. (a) Reduce the block diagram shown in figure-1 and find the C/R.

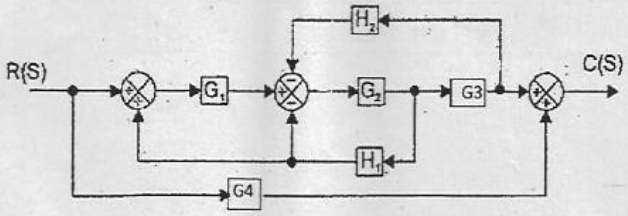

Figure-1

Or

(b) Find the overall gain of the system whose signal flow graph is shown in Figure-2.

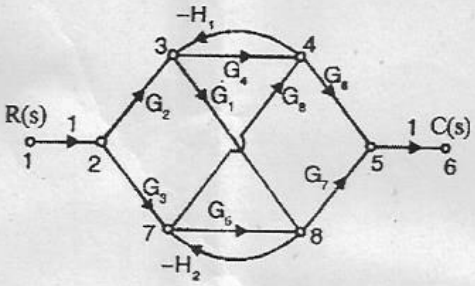

Figure-2

12. (a) A unity feedback control system is characterized by the following open loop transfer function $G(s) = (0.4s+1)/s(s+0.6)$. Determine its transient response for unit step input and sketch the response. Evaluate the maximum overshoot and the corresponding peak time.

Or

(b) Derive the expressions for under damped second order system and when the input is unit step.

13. (a) For the transfer function $G(s) = \dfrac{5(1+2s)}{(1+4s)(1+0.25s)}$. Draw the bode plot.

Or

(b) Consider a unity feedback system having an open loop transfer function $G(s) = \dfrac{k}{s(1+0.2s)(1+0.05s)}$. Sketch the polar plot and determine the value of k so that (i) Gain margin is 18 db (ii) Phase margin is 60°.

14. (a) Use the Routh stability criterion to determine the location of roots on the S-plane and hence the stability for the system represented by the characteristic equation

$s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0$.

Or

(b) Construct the Nyquist plot for a system whose open loop transfer function is given by $G(s)H(s) = \frac{k(1+s)^2}{s^3}$.

15. (a) Obtain the state model for the system $\dddot{Y} + 2\ddot{Y} + 3\dot{Y} + Y = U$.

Or

(b) Determine the state space representation of the mechanical system shown in Figure-3.

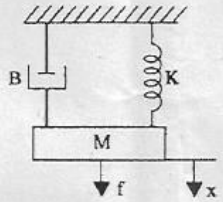

Figure-3

PART C — (1 × 15 = 15 marks)

16. (a) Obtain the transfer function for armature controlled DC servomotor.

Or

(b) The open loop transfer function of certain unity feedback system is given by $G(s) = \frac{k}{s(s+4)(s^2+4s+20)}$. Sketch the root locus of system.