Reg. No. :

Question Paper Code : 40059

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Aeronautical Engineering

AE 8505 — CONTROL ENGINEERING

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Define Thermal Capacitance.

2.   Enlist the Electrical analogies of Mechanical translational systems.

3.   Draw the block diagram algebra to move a summing point ahead a block.

4.   Compare branch and loop transmittance of signal flow graph.

5.   Define peak overshoot.

6.   Differentiate the static and dynamic error coefficients.

7.   State the necessary and sufficient conditions for Routh Hurwitz stability criterion.

8.   Sketch a neat diagram to find the angle of arrival.

9.   Define the linearity property of z-transform.

10. Express the advantages of digital control system over Analog control system.

PART B — (5 × 13 = 65 marks)

11. (a)   Derive the transfer function of Hydraulic system with suitable illustrations.   (13)

Or

(b) Obtain and Draw the equivalent force-voltage and force-current circuit with relevant expressions (Figure 11 (b)). (13)
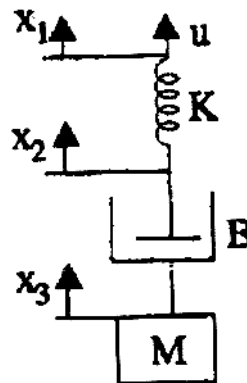

Figure – 11 (b)

12. (a) Obtain the overall transfer function by reducing the block diagram in (Figure 12 (a)). (13)
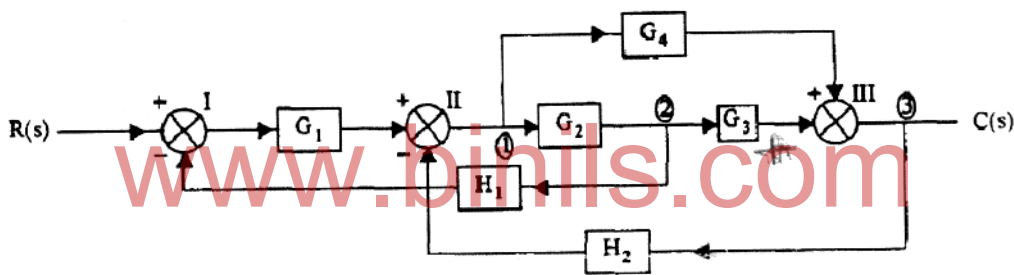

Figure – 12 (a)

Or

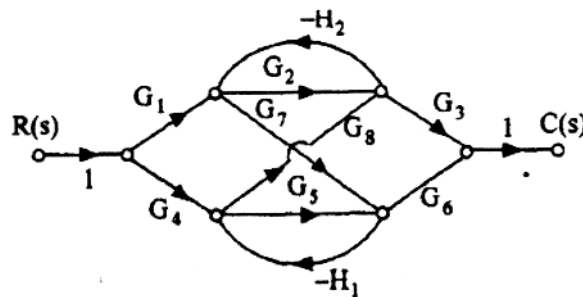(b) Obtain the transfer function using Signal Flow graph (Figure 12 (b)). (13)

Figure – 12 (b)

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13. (a) Derive an expression for the time response for unit step input for undamped and critically damped second order system. (13)

Or

(b) Determine the Velocity, position and acceleration constant and steady state errors of the given plant (Figure 13 (b)). (13)
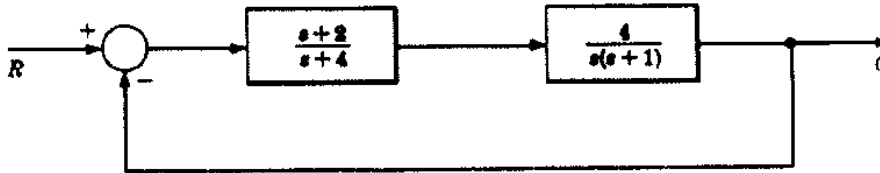

Figure – 13 (b)

14. (a) Obtain the magnitude and Phase angle plot for the system $G(S) = \dfrac{100}{S(S^2 + 12S + 100)}$. (13)

Or

(b) Sketch the root locus for $G(S) = \dfrac{K}{S(S+1)(S+3)(S+4)}$. (13)

15. (a) What is meant by sample and hold circuits and Derive the transfer function of Zero order Hold. (13)

Or

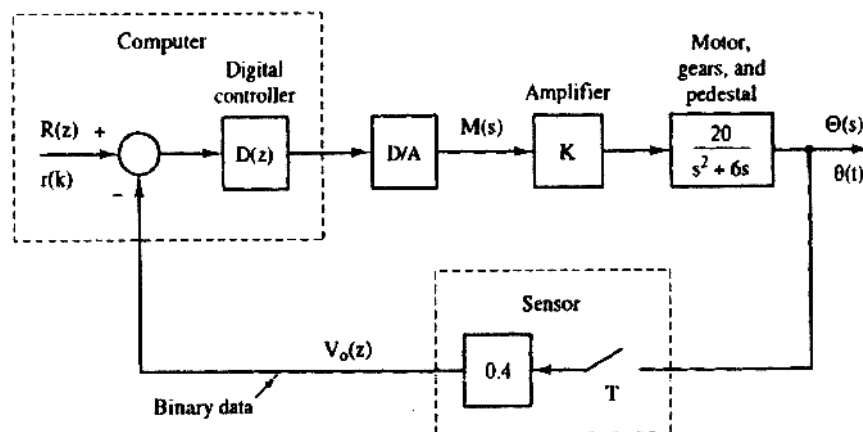(b) Design a digital PI controller for antenna control system shown in Figure 15 (b) below. (13)

Figure – 15 (b)

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PART C — (1 × 15 = 15 marks)

16. (a) Determine the stability of the closed-loop transfer function

(i) $T(S) = \dfrac{15}{S^4 + S^3 + 16S^2 + 64S + 15}$ (8)

(ii) $T(S) = \dfrac{10}{S^5 + 7S^4 + 6S^3 + 42S^2 + 8S + 56}$. (7)

Or

(b) Discuss the magnitude and phase angle criterion and describe how is it implemented in the evaluation of breakaway point, angle of departure and angle of arrival in root locus technique. (15)

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