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C20-AEI–503

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER / NOVEMBER—2023

DAEI – FIFTH SEMESTER EXAMINATION

CONTROL SYSTEMS

Time : 3 Hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. State the importance of control engineering in day-to-day life and industry.

2. Define linear control system.

3. Define transfer function.

4. List any two limitations of transfer function.

5. Define signal flow graph.

6. List any three basic components of the block diagram.

7. Define time response of a system.

8. Define type 0 and type 1 of control stytem.

9. Define gain margin.

10. List any three frequency response plots.

PART—B

8×5=40

Instructions : (1) Answer either *(a)* or *(b)*.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Explain the various components of closed loop control system and draw its block diagram.

(OR)

(b) Explain the closed loop control system with an example of temperature controller.

12. *(a)* Determine the transfer function of RLC parallel circuits.

(OR)

(b) Determine inverse Laplace transform of the following functions :

(i) $F(s)=\omega/(s^2=\omega^2)$

(ii) $F(s)=a/s(s+a)$

(iii) $F(s)=s/(s^2+\omega^2)$

(iv) $F(s)=1/s$

13. *(a)* Find the overall transfer function C/R of the block diagram shown in figure 1, using block diagram reduction techniques.

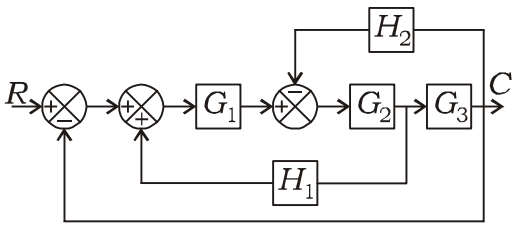

Figure – 1

(OR)

(b) Find the overall transfer function C(s)/R(s) of the signal flow graph shown in figure 2, using Masons gain formula.

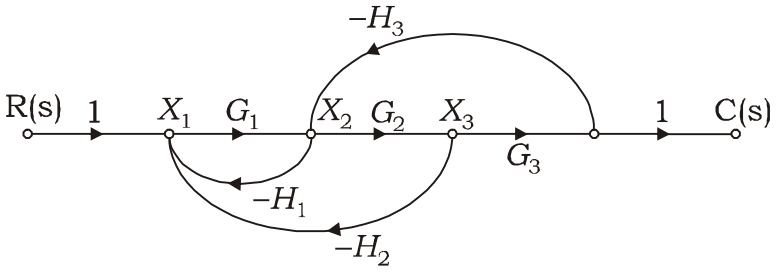

Figure – 2

14. *(a)* Find the time response of first order system for a unit step input.

(OR)

(b) For a unity feedback control system, the open loop transfer function $G(s) = (s+14)/s^2(s+10)$. Find *(i)* K_P, *(ii)* K_V, *(iii)* K_A and *(iv)* the steady state error when the input is R(s) where R(s) = $1/s^2$.

15. *(a)* Explain the procedure for phase plot and determination of gain margin and phase margin of bode plot.

(OR)

(b) Find the bode plots for the following transfer functions : *(i)* G(s)K and *(ii)* G(s)=K/s.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. Using Routh Hurwitz criterion, determine the stability of the system represented by the characteristic equation, $S^4 + 4s^3 + 10s^2 + 15s + 15 = 0$. Comment on the location of the roots of the characteristics equation.

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