F 3654 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Applied Electronics and Instrumentation/Electronics and Instrumentation Engineering

AI 010 505/EI 010 505 : CONTROL ENGINEERING–I (AI, EI)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. State Mason's gain formula.
2. List out the standard test signals.
3. Define stability.
4. What is frequency response ?
5. Distinguish lead and lag.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Write down the principles of automatic control.
7. Explain time domain specifications.
8. Discuss the effects of addition of poles and zeroes to a transfer function.
9. What is the importance of frequency domain analysis ?
10. Draw the circuit of a lag compensator. Sketch its Bode plots.

(5 × 5 = 25 marks)

Turn over

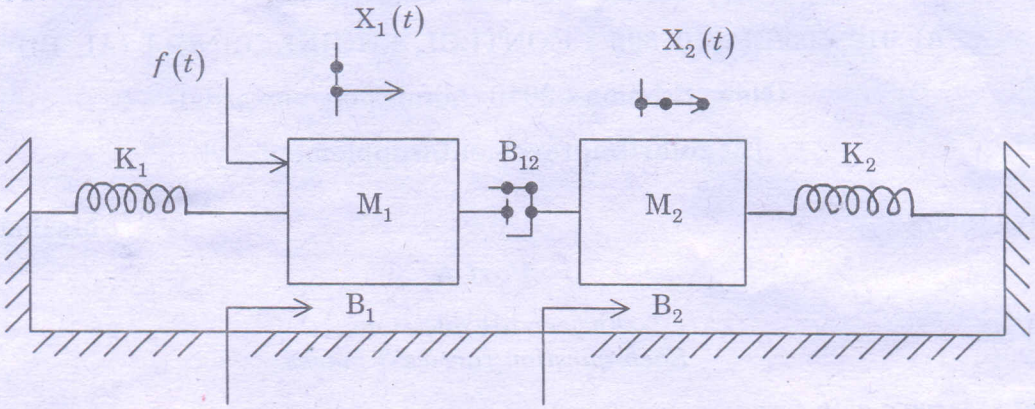
Part C

Answer **all** *questions.*
Each full question carries 12 marks.

11. Define control systems. Explain the classifications of control systems.

Or

12. Determine the transfer function $X_1(S)/F(S)$ and $X_2(S)/F(S)$ of the mechanical system shown in figure below.



13. A unity feedback system is characterised by the open-loop transfer function $G(s) = \dfrac{1}{s(1+0.5\,s)(1+0.2s)}$. Determine the steady state errors for unit step, unit ramp and unit acceleration inputs.

Or

14. Explain the static and dynamic error coefficients in detail.

15. Sketch the root locus for the open loop transfer function of unity feedback system is given by

$$G(s) = \frac{K}{s(s+3)(s^2+2s+2)}.$$

Or

16. Explain Nyquist stability criterion in detail.

17. Sketch the Bode plot for a unity feedback system characterised by

$$G(s)\,H\,(s) = \left(K\,(1+0.2\,s)\;(1+0.025\,s)\right) / \left(s^2\,(1+0.01\,s)\,(1+0.005\,s)\right).$$

Or

18. Explain (i) Relative stability ; (ii) Phase and gain margin.

19. Design a phase lag compensator so that the system $G(s)\,H(s) = 100 / [s\,(s+1)]$ will have phase margin of 15°.

Or

20. Explain any *one* compensation techniques in detail.

(5 × 12 = 60 marks)