G 1189 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Applied Electronics and Instrumentation Engineering

MODERN CONTROL THEORY (A)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. What are the differences between classical control theory approach and modern control theory approach ?
2. Express an n^{th} order system in its state variable form.
3. Given :

$$\frac{Y(s)}{X(s)} = \frac{s}{s^2 + 2s + 3}.$$

Find the revolvant matrix and express this transfer function in state variable form.

4. Convert the state model in to transfer function $\dot{X} = \begin{bmatrix} 1 & 1 \\ 2 & 6 \end{bmatrix} X + \begin{pmatrix} 1 \\ 1 \end{pmatrix} u.$
5. What is stabilizability ? How will we test it ?
6. Check the controllability of the s/m : $\dot{X} = \begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix} X + \begin{pmatrix} 1 \\ 1 \end{pmatrix} u.$
7. What is Bass Gura pole placement formula ?
8. What is a regulator system ?
9. Draw a simulink model for an interacting water take system.
10. Write commands for checking the observability of a system.

(10 × 4 = 40 marks)

Turn over

Part B

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

11. Derive the lagrange equation.

Or

12. Drive the state model of a armature controlled d.c. motor.

13. Decompose the transfer function $\frac{u(s)}{u(s)} = \frac{10(s+4)}{s(s+1)(s+3)}$ in to direct, cascade and parallel form.

Or

14. How is the state transition matrix computed. Explain all the methods.

15. Test the observability of the system using Kalman's and Gilberts Test :

$$\dot{X} = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & -3 \end{bmatrix} X + \begin{pmatrix} 0 \\ 2 \\ 0 \end{pmatrix} u.$$

Or

$y = [1 \ 0 \ 0] X.$

16. Derive the state model for a missile guidance system.

17. What are the three methods that are used to design a state feedback control law for a regulator system ?

Or

18. Consider the system $\dot{X} = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix} X + 0\,u \quad y = [1 \ \ 0] X.$

Design a full order observer. The desired eigen values of the observer matrix are $\mu_1 = -5$; $u_2 = -5$.

19. What are the different flocks available in simulink. Explain each.

Or

20. What is m-file ? Write a M file to find the step responce of a RLC circuit.

(5 × 12 = 60 marks)