Roll No. | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (Electrical & Electronics)/(Electrical Engineering)/
(Electronics & Electrical) (Sem.–5)

CONTROL SYSTEMS

Subject Code : BTEE-502-18

M.Code : 78310

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Answer briefly :

1) What do you mean by linear time invariant system? Discuss.

2) Discuss the advantages of block diagram algebra.

3) What do you mean by Ramp input test signal? Discuss.

4) What do you mean by relative stability? Discuss.

5) a) List the characteristics and advantages of state variable modelling.

   b) Discuss the need of state variable analysis.

6) What is gain margin? Explain.

7) Discuss the principle of Nyquist criterion.

8) List the various advantages of root locus.

9) What is the need of optimal control? Explain.

10) Define state and state variable.

SECTION-B

11) Differentiate between open loop and closed loop control systems? Mention at least TWO examples of each type of system. Also discuss the benefits of feedback.

12) Determine the stability of the system using Routh-Hurwitz criteria whose characteristics equation is given by $s^6 + 4s^5 + 3s^4 + 4s^3 + 2s^2 + 17s + 33 = 0$

13) Explain the terms :

a) Steady state accuracy

b) Transient accuracy

c) Disturbance rejection

d) Insensitivity

e) Robustness

14) Sketch the Bode plot (magnitude plot only) of the following transfer function $G(s)H(s) = \dfrac{2000}{s(s+2)(s+100)}$.

15) Find the controllability and observability of the following system.

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ 0.4 & -1.3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 0.8 & 1 \end{bmatrix} x(t)$$

SECTION-C

16) A unit feedback system has an open loop transfer function $G(s) = \dfrac{25}{s(s+8)}$. Derive the output equation in time domain for this system, if it is exposed to unit Step input. Also calculate the Rise time, Peak time and Maximum peak overshoot for step input.

17) a) Design a phase lag compensating network for $G(s)=\frac{K}{s(1+0.1s)(1+0.2s)}$ to meet the following specifications : $K_v = 30\ sec^{-1}$, P.M. ≥ 40 ←.

b) Sketch the Nyquist plot and there from assess the stability of the closed loop system whose open loop transfer function is $G(s)H(s)=\frac{K(s+4)}{s^2(s+1)}$.

18) Discuss the following :

a) Basic concepts of Nonlinear system.

b) Root locus method of feedback controller design.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.