Printed Pages: 02 **Subject Code: REE503**

Paper Id: **120503** **Roll No:** | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2018-19
CONTROL SYSTEM

Time: 3 Hours ***Total Marks:70***

Notes: *Assume any Missing Data.*

SECTION – A

1. Attempt all parts of the following. **(7*2=14)**

(a) What is Masons's gain formula?
(b) What is an impulse response?
(c) What is steady state error?
(d) Define damping ratio.
(e) Define gain cross over frequency and phase margin?
(f) What is Centroid in root locus?
(g) Define State variable and state space.

SECTION – B

2. Attempt any three parts of the following: **(3*7=21)**

(a) For a unity feedback system the open loop transfer function is given by

$$G(s) = K/s(s+2)(s^2+6s+25)$$

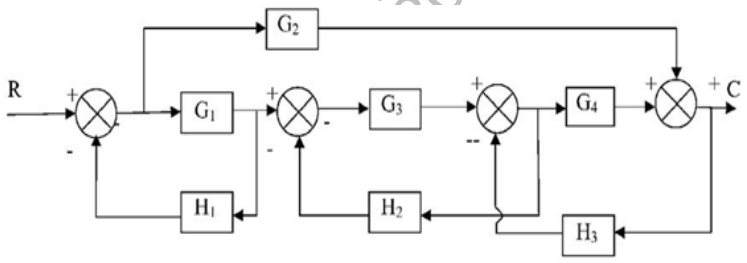
(i) Sketch the root locus **(ii)** At what value of 'K' the system becomes unstable. **(iii)** At this point of instability determine the frequency of oscillation of the system.

(b) Explain the working of servomotor with suitable diagram and also derive the field controlled D.C. motor transfer function.

(c) Draw the Nyquist plot for the unity feedback system whose open loop transfer function is

$$G(s)H(s) = \frac{K}{s^2(1+sT)}$$

(d) Determine the transfer function of the circuit given below-



(e) Establish the correlation between time response and frequency response analysis and suitably explain with diagrams.

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SECTION - C

Note: - All questions are compulsory. **(5*7=35)**

3. Attempt any one parts of the following:

(a) Find the generalized error coefficients for a system whose G(S) H(S) =1/S (S+2) and also find the expression for steady state error for input $r(t)=2+ 3t + 2t^3$.

(b) Sketch the polar plot for the following transfer function

$$G(S) = (1+4S)/ S^2 (S+1) (2S+1)$$

4. Attempt any one parts of the following:

(a) Explain P, PI, PID controllers and also give their advantages.

(b) Derive the expressions for second order system for under damped case and when the input is unit step.

5. Attempt any one parts of the following:

(a) Construct the state model of a system characterized by the differential equation. Give the block diagram representation of the state model.

$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = u$$

(b) A single input signal output system is given as

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 2 & -3 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 1 & 1 \end{bmatrix} \text{ and } C = [1\ 0\ 0].$$

Test for controllability and observability.

6. Attempt any one parts of the following:

(a) For the given transfer function-

$$G(s)\,H(s) = \frac{2}{s(1+0.5s)(1+0.05s)}$$

Determine phase crossover frequency and gain margin.

(b) The forward path transfer function of unity feedback control system is G(s) =100/s(s+6.45). Find the resonance peak M_r, resonant frequency ω_r and bandwidth of the closed loop system.

7. Attempt any one parts of the following:

(a) What is the effect of adding pole to a system? Discuss.

(b) Explain the lag compensation.

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