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Total Number of Pages : 02

B.Tech
PET51101

5th Semester Regular / Back Examination 2019-20

CONTROL SYSTEMS

BRANCH : ECE, ETC

Max Marks : 100

Time : 3 Hours

Q.CODE : HRB078

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- Differentiate between time variant and time invariant system?
- Write down the magnitude criterion and the angle criterion for a point to be on the root locus. How is the gain K at a particular location determined?
- What are the two special case of Routh's criteria?
- Define words and equation, the sensitivity of feedback control system?
- What is the effect of the negative feedback on time constant and bandwidth of the system?
- Explain Nquist Criterion?
- State the analogous quantities for mechanical rotational system and electrical systems in force-voltage analogy.
- Distinguish between transfer function and frequency transfer function?
- Why Nichols chart is used?
- Given the following polynomial equation $s^3 + 5.5s^2 + 8.5s + 3 = 0$. Determine the number of roots of the polynomial which have real parts strictly less than -1 .

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the constant M circles, the constant N-circles with expression?
- The open loop transfer function of a unity feedback system is $(S) = \frac{K}{s(ST+1)}$. Where K and T are constants. How many times the gain should be increased to increase the overshoot from 50% to 60%.
- The transfer function of a system is given as $G(s) = \frac{Y(s)}{R(s)} = \frac{1}{s^2 + 2s + 5}$. Find y(t), if the input is a unit step signal. Identify the transient and the steady state components of the output response Using final value theorem find the steady state value of y(t).
- Sketch the bode plot of open loop transfer function is $G(s)H(s) = \frac{K}{s(s+1)(s+2)}$. Find the gain margin and phase margin.
- Consider a system described by a differential equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 25y = 50x(t)$. Find out the time domain behavior and the maximum output for a 2.5 unit step input.
- For a unity feedback second order system whose open loop transfer function is $\frac{4}{s(s+2)}$. Determine the maximum overshoot and the time to reach the maximum overshoot when step displacement of 18° is given to the system. Find the rise time, delay time and settling time for a steady state error of 7%.