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Roll No

EE/EX-7005(4)-CBGS

B.E. VII Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Advanced Control System

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Assume the missing data suitably (if any).

1. Draw the Bode plot. Find the gain and phase margins and comment on the stability of the system.

$$G(s)H(s) = \frac{2(s+0.5)}{s^2(s+0.2)(s+1)}$$

2. Discuss the process of Pole-placement regulator design for single input system.
3. Design a full state feedback regulator for an inverted pendulum placed on a moving cart.
4. a) Define the variable structure control with the help of suitable example.
b) Why the transfer function approach is not suitable for variable structure problem. Which modeling method then should be applied to deal with such problems?

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5. Define the following terms:
- Describing function
 - Dead zone
 - Saddal point
 - Focus point
 - Limit cycle
 - Singular point
6. a) Discuss the Liapunov stability criteria for a nonlinear system. Also discuss the limit cycle behaviour of nonlinear systems.
- b) Discuss in brief the method of plotting the phase-plane trajectory for a system whose feed forward transfer function is $K/s(1+sT)$ with unity feedback. Let the step input is applied to the system. Assume the suitable data if necessary.
7. Consider the linear plant of a system characterized by the transfer function $G(s) = 100/s^2$. The objective of the system is to make the output $c(t)$ follow the step input $r(t)$ minimizing
- $$J = \int_0^{\infty} \left[\left(\dot{c}(t) - c(t) \right)^2 + 0.25u^2(t) \right] dt$$
- Where $u(t)$ is the actuating signal.
8. Discuss the following terms in detail:
- Pontygin's maximum principle in optimal control design
 - Nyquist stability criteria

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