UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination

Programme Name: B. Tech ASE+AVE | **Semester : VIII**
Course Name : Control System Engineering | **Time : 03 hrs**
Course Code : ELEG 271 | **Max. Marks : 100**

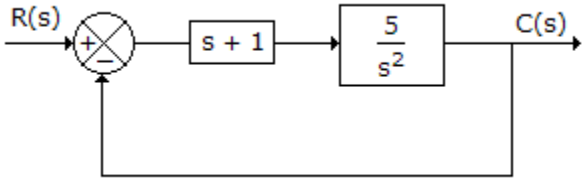
Part A : Each questions carries two marks (15*2=30)

Multiple Choice Questions

1. Transfer function of a system is defined as the ratio of output to input in

a) Z-transformer b) Fourier transform
c) Laplace transform d) All of these

2. For the given figure C(*s*)/R(*s*)



a) $\frac{5s + 5}{s^2 + 5s + 5}$

b). $\frac{5s - 5}{s^2 + 5s + 5}$

C. $\frac{5s}{s^2 + 5s + 5}$

d). $\frac{5}{s^2 + 5s + 5}$

3. Steady state error is always zero in response to the displacement input for

a) Type 0 system b) Type 1 system
c) Type 2 system d) Type (N > 1) system for N= 0, 1, 2….N

4. In an automatic control system which of the following elements is not used ?

a)Error detector b) Final control element
c) Sensor d) Oscillator

5. Which of the following statements is not necessarily correct for open control system?
a) Input command is the sole factor responsible for providing the control action
b) Presence of nonlinearities causes malfunctioning
c) Less expensive
d) Generally free from problems of nonlinearities

6. A controller, essentially, is a
a) Sensor b) Clipper c) Comparator d)Amplifier

7. Relation between Fourier integral and Laplace transformer is through
a) Time domain b) Frequency domain
c) Both (a) and (b) d) None of these

Fill in the blank Questions

8. With feedback _____ reduces.
9. The type 0 system has _____ at the origin.
10. Velocity error constant of a system is measured when the input to the system is unit _____ function.

True or False Questions

11. A closed-loop control system uses a measurement of the output and feed-back of the signal to compare it with the desired input.

12. Addition of zero increases the stability.

13. If rise time is also taken into consideration it should be consistent to the settling time.

14. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is unstable.

15. The phase margin and damping ratio have no relation.

Part B : Each questions carries ten marks (5*10=50) having internal choices in Q20

16. What are the components of feedback (FB) control system and what types of FB is employed in control systems also explain the effects of FB in Automatic Control Systems.

17. Define damping ratio? Classify the system damping. A unity feedback control system has an amplifier with gain $\mathbf{K_A = 10}$ and gain ratio $\boldsymbol{G(s) = \frac{1}{S(S+2)}}$ in the feed forward path. A derivative feedback $\mathbf{H(s) = sk_0}$ is introduced as a minor loop around G(s) Determine the derivative feedback constant $\mathbf{K_0}$ so that the system damping factor is **0.6**

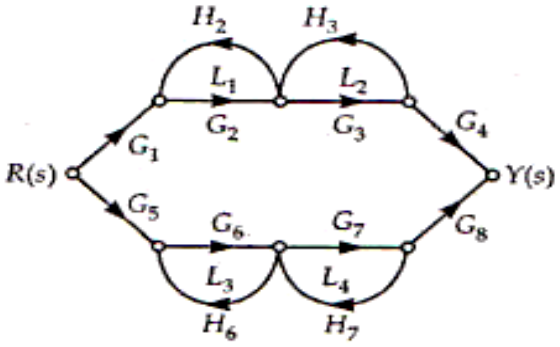
18. What is type number and order of a system? The damping ratio of a system is 0.75 and the natural frequency of oscillation is 12radians/sec. determine the peak overshoot and the peak time.

19. Explain the condition for stability? The system whose open loop transfer function is,

$$\boldsymbol{G(s) = \frac{K}{s(s+2)(s+4)}}$$

Find the value of K (Use Root Locus Method)

20. Compare the BDR and SFG? Determine the No of forward path, individual loop gain and no of non-touching loop gain from Figure



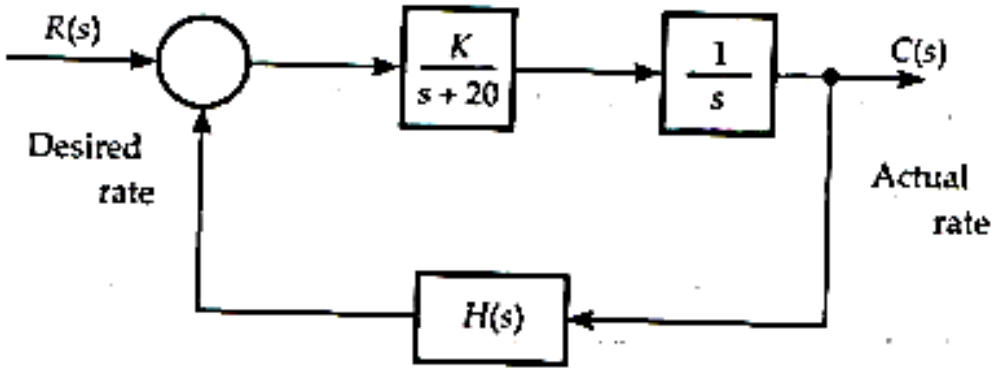
(Or)

Briefly explain the following

a) Phase crossover frequency
b) Gain crossover frequency
c) Gain margin
d) Phase margin

Part C (20 Mark question having internal choices)

21. The block diagram of an electronic controller the rate is shown in figure Assuming the unity feedback and K = 400,



Calculate

a) The output C(t) for unit step input
b) Steady-state error for unit ramp input
c) Determine K if the error to a ramp input is 0.02

(Or)

Determine whether the system that follows is state controllable and observable. The A, B, and C Matrices and state and output equation are

$$\mathbf{A} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$$

$$\mathbf{B} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\mathbf{C} = [1 \quad 0]$$