AJEENKYA
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End Term Examinations (April 2019)

School: School of Engineering **Program: B.Tech (Biomedical Engineering)**

Course: Physiological Control Systems **Course Code: BME305**

Semester: VI **Max Marks: 40** **Duration (mins): 120**

PART-A

(Write Very Short / One Line Answer)

Note: Answer all questions. Each question carries 1 mark. [10]

1. Explain the open loop control system.
2. Define non-touching loops.
3. Write mason's gain formula.
4. Write the expression for peak time (t_p) in terms of ω_n and ζ.
5. Distinguish between the type and order of a system transfer function.
6. Discuss the effect of adding pole to open-loop transfer function.
7. Define BIBO stability.
8. Define phase crossover frequency
9. Define phase margin.
10. How gain margin and phase margin determined from the bode plot?

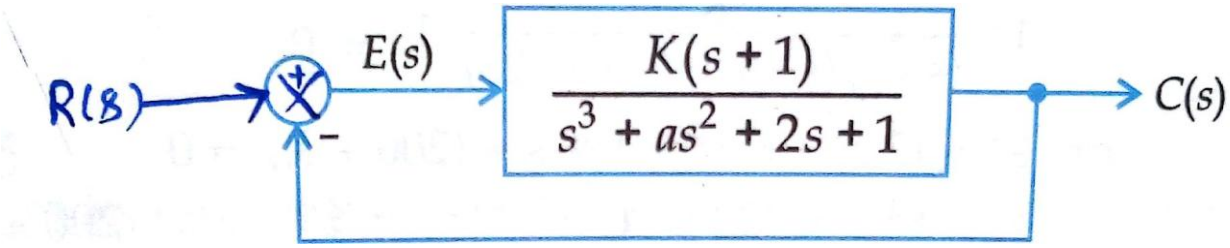
PART-B

(Short Answer Questions – Not More Than 150 Words)

Note: Answer any four questions. Each question carries 5 marks. [20]

11. Write the difference between engineering and physiological control systems
12. Draw and explain the Block diagram representation of the muscle stretch reflex

13. A system oscillates with frequency ω, if it has poles at s = ±jω and no pole in the right half of s-plane. Determine the value of 'k' and 'a' so that the system shown in figure oscillates at a frequency 2 rad/sec.



14. For a unity feedback control system the forward path transfer function is given by G(s) = $\frac{20}{s(s+2)(s^2+2s+20)}$. Determine the steady state error of the system. When the inputs are (i) 5 (ii) 5t (iii) $\frac{3t^2}{2}$

15. Sketch the polar plot for G(s) = $\frac{20}{s(s+1)(s+2)}$

16. Apply Routh-Hurwitz criterion to the following equation and investigate the stability.
$s^5 + 2s^4 + 24s^3 + 48s^2 - 25s - 50 = 0$

PART-C

(Long/Case Study/Essay Type Answer Questions)

Note: Answer any one question. Each question carries 10 marks. [10]

17. Plot the root locii for the closed loop control system with

G(s) = $\frac{K}{s(s+6)(s^2+4s+13)}$ H(s) =1.

18. Draw the bode plot for a unity feedback system having

G(s) = $\frac{200}{(s+1)(s+100)}$ H(s) =1.

Determine:

(i) Gain cross over frequency

(ii) phase margin

(iii) Gain margin

(iv) Stability of the system

Note: Along with this paper we need **graph** paper and **semi log** paper