AJEENKYA
D Y PATIL UNIVERSITY

End Term Examination (December 2019)

School: School of Engineering **Program: M.Tech Biomedical (BM)**

Course: Physiological Modeling and Computation **Program Code: BEN601**

Semester: III **Max Marks: 40** **Duration (mins): 90**

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. What do you understand by distributed parameter model?
3. What is SIMULINK?
4. Give an example of physiological system modelling.
5. Write the expression for peak time (t_p) in terms of ω_n and ζ.
6. Distinguish between the type and order of a system transfer function.
7. Discuss the effect of adding pole to open-loop transfer function.
8. Define BIBO stability.
9. What is muscle stretch reflex?
10. Explain system variables and properties- Resistance, compliance and analogy.

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(1) oscillates at a frequency 2 rad/sec.

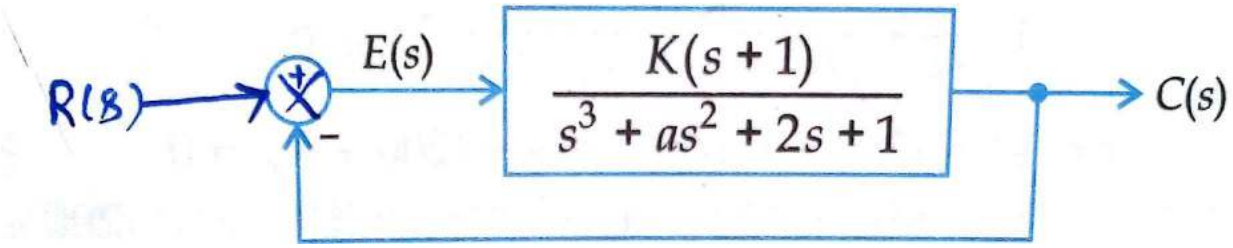

figure (1)

14. Draw and explain the SIMULINK model of simple lung mechanics. Justify the results of model.
15. Explain Hodgkin and Huxley's model of action potential
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) = $\frac{K}{s(s+6)(s^2+4s+1)}$ H(s) =1.
18. Derive all the equations showing the dynamics of the neuromuscular reflex motion with suitable diagrams.