Register No.:   ....   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), MAY 2023
ROBOTICS AND AUTOMATION
(2021 Scheme)

Course Code: **21RA206-D**

Course Name: **Adaptive Control Systems**

Max. Marks: **60**   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Draw the block diagram of a robust high gain system.
2. Describe the effects of load disturbances.
3. State sign-sign algorithm.
4. Enumerate adaptive backstepping algorithm.
5. Describe nonlinear transformation process.
6. Explain the gain scheduling application in an oxygen trim controller.
7. Illustrate sampling, pre and post filtering.
8. Paraphrase Youla parametrization.

PART B
(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. a) Comment on the key problems in autopilot design for a ship steering problem. (4)
    b) State least squares estimation theorem. (2)

OR

10. a) With neat diagrams, explain about any adaptive scheme. (4)
    b) Explain the various steps in the construction of an adaptive controller. (2)

MODULE II

11. a) Using neat diagrams, explain the working of a self-tuning regulator. (4)
    b) Write an example of continuous time self-tuner. (2)

OR

12. a) Describe the various steps of pole placement design. (4)

    b)   Explain about direct self tuning regulator.   (2)

MODULE III

13.   Give a brief analysis of floquet theory.   (6)

OR

14.   Explain the MRAS gain adjustment based on MIT rule.   (6)

MODULE IV

15.   a)   Enumerate the design of gain scheduling controller for any particular application.   (4)

    b)   Illustrate the concept of passivity.   (2)

OR

16.   a)   Comprehend adaptive feedback linearization.   (4)

    b)   With proper equations, represent backstepping technique.   (2)

MODULE V

17.   Summarise the concept behind nonlinear transformations of a second order system.   (6)

OR

18.   Obtain the control configuration for a pH control problem.   (6)

MODULE VI

19.   a)   Describe about the adaptive control implementation for ultrafiltration process.   (3)

    b)   List and explain the effects of computation delay in controller implementation.   (3)

OR

20.   a)   Describe about controller windup.   (4)

    b)   Devise a procedure for implementing a control algorithm.   (2)

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