F **486B1** **Total pages: 2**

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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION(R,S), MAY 2024

M. Tech. 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. Explain why estimating parameters accurately is crucial for the performance of dynamical systems.
2. Examine the advantage of self-tuned regulators in handling disturbances with known characteristics compared to fixed-parameter controllers.
3. Explain the role of Lyapunov Theory in ensuring stability in MRAS design.
4. List any three differences between MRAC and STR.
5. Examine how gain scheduling enhance the performance of controllers in dynamic system.
6. Explain the term "non-linear transfer function".
7. Examine the steps involved in selecting robotic sensors.
8. Quote the significance of controller wind-up.

PART B

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

MODULE I

9. Examine the principle of least squares in implementing control algorithms with the help of equations. 6

OR

10. Evaluate the role of adaptive control systems in enhancing the performance of real world problems. 6

MODULE II

11. Illustrate the significance of pole placement design in self-tuning regulators. 6

OR

12. With relevent block diagram, demonstrate how self-adjusting regulators operate. 6

MODULE III

13. Illustrate the implementation of MIT rule for non-linear systems with the help of a block diagram. 6

OR

14. Distinguish between model reference adaptive control and model predictive control. 6

MODULE IV

15. Sketch out the application process of self-tuned regulators in nonlinear systems. 6

OR

16. Differentiate between feedback linearization and adaptive feedback linearization. 6

MODULE V

17. Evaluate situations where gain scheduling approach can be applied in the case of wheeled mobile robot navigation. 6

OR

18. Implement gain scheduling in a ship steering system. 6

MODULE VI

19. Using an example, analyze the impact of computational delay on the implementation of nonlinear systems. 6

OR

20. Explore the challenges associated with implementing adaptive control and enumerate alternative approaches. 6

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