KUMARAGURU college of technology
character is life

Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL/MAY 2016

(Regulation 2009)

Eighth Semester.

ELECTRONICS AND INSTRUMENTATION ENGINEERING

EIE126: Adaptive Control

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In ----------, controller parameters are changed directly without the characteristics of the process and its disturbances being determined.
   a) System identification b) Direct adaptive control
   c) Indirect adaptive control d) Tuning
2. ---------- controller uses stochastic control theory.
   a) Gain scheduling b) Model reference adaptive system
   c) Self tuning regulator d) Dual control
3. In ---------- model, the output signal appears delayed in the regression vector.
   a) Regression b) Auto regression
   c) FIR d) IIR
4. If $\Phi^T\Phi$ is non singular, then E $\theta(t)$
   a) Θ^0 b) Θ^2
   c) Θ^3 d) Θ^1
5. In self tuning controllers, direct updating of controller parameters is called as --------- control.
   a) indirect b) explicit
   c) implicit d) direct
6. Combining recursive least square with the minimum degree pole placement for controller design gives
   a) Direct self tuner b) Indirect self tuner
   c) stochastic self tuner d) Both b and c
7. The Lyapunov method is used to find adaptive control laws for --------- systems.
   a) Only linear b) Only non linear

c) Both linear and non linear d) Stable

8. The parameters in model adaptive reference system can be adjusted by

a) Using gradient method b) Applying stability theory

c) Using error between model and closed loop system d) All the above

9. ---------- is the foremost method for handling parameter variations in flight control system.

a) Gain scheduling b) STR

c) Dual control d) MRAS

10. In -------- method, the experiments required are performed in open loop

a) Relay feedback b) transient

c) Describing function d) Phase Plane

PART B (10 x 2 = 20 Marks)

11. Bring out the difference between adaptive control system and conventional closed loop control system.
12. Review system identification by step response method.
13. What is Pseudo Random Binary sequence in system identification.
14. Write the purpose of using RLS technique in an estimation problem.
15. Define certainty equivalence principle.
16. Criticize stochastic STR.
17. Define positive definite and semi definite function.
18. Give the relation between MRAC and STR.
19. Mention the different auto tuning techniques.
20. Mention the applications of adaptive controllers.

PART C (5 x 14 = 70 Marks)

21. a) What is adaptive control? Illustrate in detail the different types of adaptive control schemes with neat block diagrams.

(OR)

b) Illustrate the following mechanisms that give rise to variation in process dynamics. Also show the effects of process variations on the performance of control system.

(i) Non linear actuators

(ii) Flow and speed variations

22. a) Review ARX and ARMAX models in detail. Also Discuss in general the difficulties encountered in Non-Linear Identification.

b) Elaborate in detail the process of Parametric Identification by Least square estimation.

23. a) Define what is a Self-Tuning Control (STC) technique in an adaptive control application? Also elaborate on direct and indirect STC techniques.

(OR)

b) Explain the design procedure of Self tuning regulator using pole placement method.

24. a) Discuss the Model Reference Adaptive Control (MRAC) approach and the MIT Rule in deriving a suitable control law.

(OR)

b) Design a MRAS controller for a first order system by Lyapunov method. State the conditions to be met to ensure parameter convergence.

25. a) Explain the principle of gain scheduling controller with a neat block diagram. Design a gain scheduling controller for a nonlinear system.

(OR)

b) Justify how relay feedback method is better for auto-tuning. Explain any two methods.

****