

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Electrical & Electronics Engineering

(Control Systems, Guidance and Navigational Control, Power System and Control)

01EE6114 Adaptive Control

Max. Marks: 60

Duration: 3 Hours

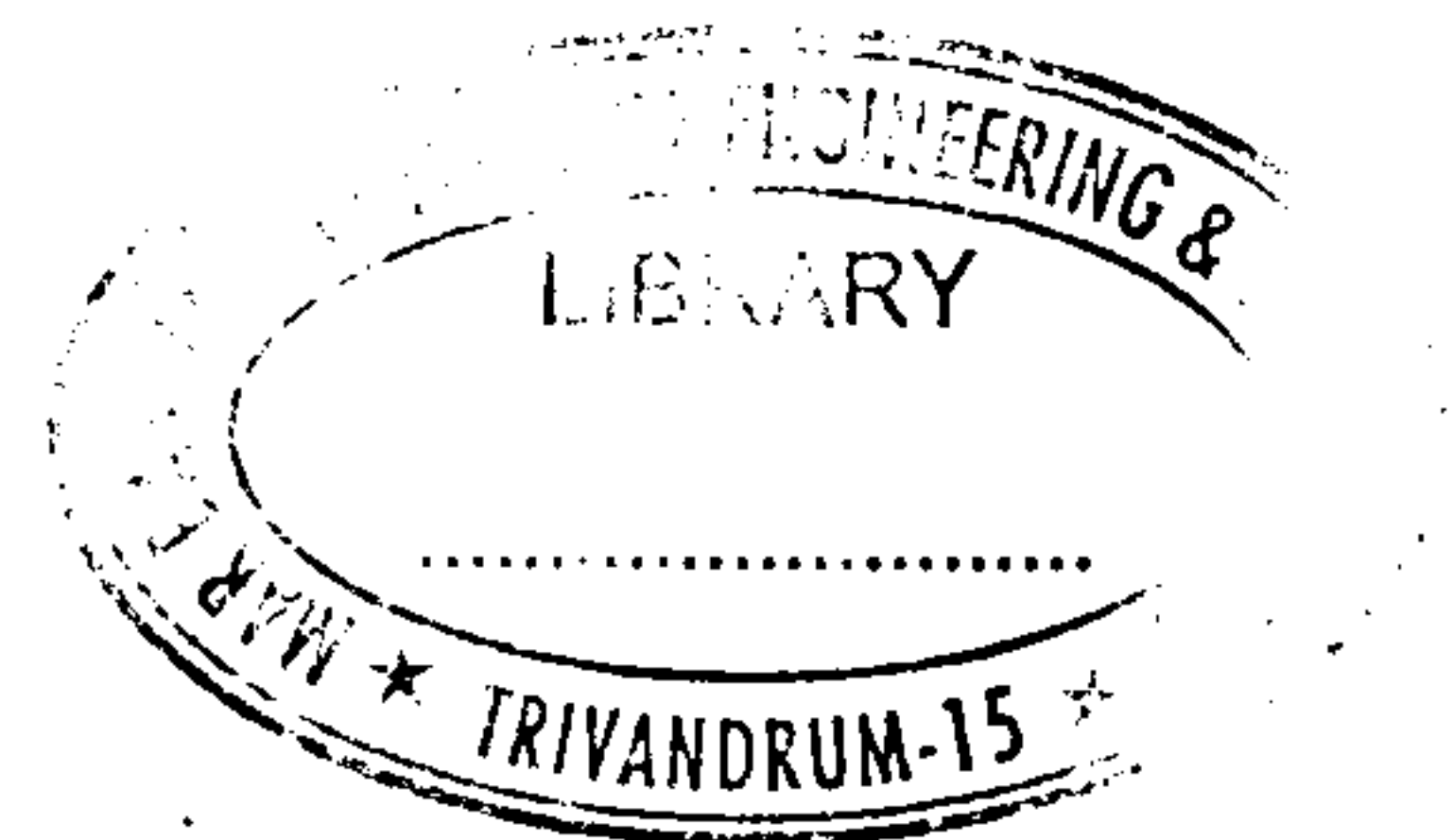
(Answer any two full questions from each part)

PART A

1. Explain the different types of adaptive schemes with help of block diagram. (9)
2. Design a model following Minimum Degree Pole Placement controller for a continuous time process $G(s) = \frac{1}{s(s+1)}$. The sampling period is 0.5sec. The desired closed loop system has natural frequency of 1 rad/sec and relative damping of 0.7. (9)
3. i) What are the classifications of self-tuning regulators (5)
 ii) Explain the significance of exponential forgetting in least square method. (4)

PART B

4. Derive MRAS for a first order system described by the model $\frac{dy}{dt} = -ay + bu$ using Lyapunov method (9)
5. Design a controller using adaptive feedback linearization for system described by $\frac{dx_1}{dt} = x_2 + \theta f(x_1)$, $\frac{dx_2}{dt} = u$, where θ is an unknown parameter and f is a known differentiable function (9)
6. i) What is adaption gain? How the adaption gain is determined for adjusting feed forward gain of a plant with transfer function $kG(s)$, where $G(s)$ is known and k is an unknown parameter? (5)
 ii) Explain the stabilization of a nonlinear system using back stepping (4)



PART C

7. Design a gain scheduling controller for the system $\frac{dx_1}{dt} = f_1(x_1, x_2), \frac{dx_2}{dt} = f_2(x_1, x_2, u)$ (12)
so as to get the closed loop system dynamics equivalent to the transfer function
$$\frac{w^2}{s^2 + 2\zeta ws + w^2}$$
8. What are the practical aspects taken in to consideration while implementing an adaptive (12)
controller?
9. i) Explain any one application of gain scheduling (6)
- ii) What are the operational issues in practical implementation of adaptive control? (6)
-