Code No: RR411305

Set No.1

IV B.Tech. I Semester Regular Examinations, November -2005
ADAPTIVE CONTROL SYSTEMS
(Common to Electronics & Control Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define adaptivity and various types of adaptivitives.
   (b) Explain the self-oscillating adaptive systems. [8+8]

2. (a) Explain the relation between MRAS and STR.
   (b) Consider the system G(s)=G_1(s) G_2(s)
   Where G_1(s)= $\frac{b}{s+a}$; G_2(s)= $\frac{c}{s+d}$
   Where 'a' and 'b' are unknown parameters and c and d are known. Discuss how to make as MRAS based on the gradient approach. [6+10]

3. (a) State and explain the BIBO stability criterion for static and dynamical systems.
   (b) Explain the design procedure of MRAS using gradient approach. [8+8]

4. Explain Osdan's system of adjustment of system parameter to maintain specified closed loop pole-zero configuration. [16]

5. Explain with the help of block diagram the adaptive control system suggested by Braun. [16]

6. (a) Explain the pole-placement design procedure of self-timing regulators.
   (b) State and explain hyper stability. [8+8]

7. (a) Consider the function V (x) = x^T Ax+b^T x+c
   Where x and b are column vectors, A is a matrix and C is a scalar. Show that the gradient of function V with respect to x is gives by $grad_x$ V=(A^T+A)x+b.
   (b) Determine the conditions in which a second order transfer function

   G(s)= $\frac{b_o s^2+b_1 s+b_2}{s^2+a_1 s+a_2}$ is strictly positive real. [8+8]

8. Write short notes on:
   (a) Small gain theorem
   (b) Marx system
   (c) Learning in adaptive system. [6+5+5]

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ADAPTIVE CONTROL SYSTEMS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the concept of adaptive control system.
   (b) What are the major components of adaptive control system? Explain each of them in detail. [8+8]
2. An integrator $G_p = \frac{q}{s}$ is to be controlled by a zero-order continous-time controller u(t) = $-S_o y(t) + t_o u_c$ (t). The desired response model is given by G_m= $\frac{b_m}{s+a_m}$. Derive a phasemeter update law of an MRAS guaranteeing that the error e=y-y_m goes to zero. [16]
3. (a) State and explain the passivity theorem to satisfy BIBO stability.
   (b) State and explain the Liaponov stability theorem. [8+8]
4. (a) With the help of block diagram explain the self-tunning regulator.
   (b) Consider the process G(s)= $\frac{1}{s(s+a)}$, where 'a' is an unknown parameter. Assume that the desired closed system is
   G_m(s)= $\frac{W^2}{s^2+zws+w^2}$. Derive continuous - time indirect self-tuning algorithms for the system. [8+8]
5. Explain the adaptive control system suggested by Merrian. [16]
6. (a) Explain the generalised minimum-variance method for design of self-tuning controller.
   (b) State and explain the hyper stability. [8+8]
7. (a) With suitable block diagram explain the adjustment of a feed forward gain.
   (b) Determine the conditions in which a second order transfer function

   G(s)= $\frac{b_o s^2+b_1 s+b_2}{s^2+a_1 s+a_2}$ is strictly positive real. [8+8]
8. Write short notes on:
   (a) Braun's method
   (b) Learning in adaptive system
   (c) MIT rule. [6+5+5]

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Code No: RR411305 **Set No.3**

IV B.Tech. I Semester Regular Examinations, November -2005
ADAPTIVE CONTROL SYSTEMS
(Common to Electronics & Control Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain with examples the concept of adaptive control systems.
   (b) Explain essential adaptives of adaptive contro, essential ratio of adaptive control. [8+8]
2. An integrator $G_p = \frac{q}{s}$ is to be controlled by a zero-order continuous-time controller u (t) $= -S_o y(t) + t_o u_c$ (t). The desired response model is given by $G_m = \frac{b_m}{s+a_m}$. Derive, a parameter update law of an MRAS guaranteeing that the error e =y-y_m goes to zero. [16]
3. (a) State and explain the BIBO stability criterion for static and dynamical systems.
   (b) State and explain Liaponov stability theorem. [8+8]
4. Explain Andrson system of adjustment of system parameter to maintain specified closed-loop pole-zero configuration. [16]
5. Consider the model y(t)= a+bt+e(t), assume continuous time observation, where $\{e(t)\}$ is a random function with Covariance $\delta(t)$. Determine the estimate and its Covariance. Analyze the behaviour of the Covariance for loss observation intervals. [16]
6. (a) Explain the pole-placement design procedure of self-tuning regulators.
   (b) State and explain hyper stability. [8+8]
7. (a) Draw a suitable block diagram and explain the adjustment of a feed forward gain.
   (b) Determine the conditions in which a second order transfer function

   G(s)= $\frac{b_o s^2+b_1 s+b_2}{s^2+a_1 s+a_2}$ is strictly positive real. [8+8]
8. Write short notes on:
   (a) Braun's method
   (b) Marx system
   (c) MIT rule. [6+5+5]

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Code No: RR411305 **Set No.4**

IV B.Tech. I Semester Regular Examinations, November -2005
ADAPTIVE CONTROL SYSTEMS
(Common to Electronics & Control Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain various types of adaptives.
   (b) Explain the self oscillating adaptive systems. [8+8]
2. (a) Explain the relation between MRAS and STR.
   (b) Consider the system G(s) = G_1 (s) G_2 (s)
   Where G_1 (s) = $\frac{b}{s+a}$; G_2 (s)= $\frac{c}{s+d}$
   Where a and b are unknown parameters and c and d are known. Discuss how to make an MRAS based on the gradient approach. [8+8]
3. (a) State and explain the passivity theorem to satisfy BIBO stability.
   (b) Explain the algorithm of direct self-tuning regulators. [8+8]
4. Explain Marx system of adjustment of system parameter to maintain specified closed-loop pole-zero configuration. [16]
5. Explain with the help of required block diagram Kalman's method of adaptive control. [16]
6. (a) Explain the generlized minimum-variance method for design of self-tuning controller.
   (b) State and explin the hyper stability. [8+8]
7. (a) With a suitable block diagram explain the adjustment of a feed forward gain.
   (b) Determine the conditions in which a second order transfer function

   G(s)= $\frac{b_o s^2+b_1 s+b_2}{s^2+a_1 s+a_2}$ is strictly positive real. [8+8]
8. Write short notes on:
   (a) MIT rule
   (b) Braun's method
   (c) Pole-placement design procedure. [5+6+5]

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