Code No: 58012 **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV B.Tech. II Sem., II Mid-Term Examinations, April-2014
ADVANCED CONTROL SYSTEMS
Objective Exam

Name: _____ **Hall Ticket No.** | | | | | | A | | | | |

Answer All Questions. All Questions Carry Equal Marks. Time: 20 Min. Marks: 10.

I. Choose the correct alternative:

1. Lyapunov's stability theorem satisfies the condition for a scalar function V(x) and some real number $\varepsilon > 0$; Lyapunov's stability theorem satisfies the properties for all x in the following region. [ ]
   a) $\|x\| > \varepsilon$ b) $\|x\| \leq \varepsilon$ c) $\|x\| \geq \varepsilon$ d) $\|x\| < \varepsilon$

2. The condition for globally asymptotically stable for all x, V (x) is radially unbounded. [ ]
   a) $V(x) \to \infty$ as $\|x\| \to \infty$ b) $V(x) \to 0$ as $\|x\| \to 0$
   c) $V(x) \to -\infty$ as $\|x\| \to \infty$ d) $V(x) \to 0$ as $\|x\| \to \infty$

3. A scalar function W (x) in the Lyapunov's Instability theorem must not be [ ]
   a) Positive semi-definite b) Negative semi-Indefinite
   c) Positive semi- Indefinite d) Negative semi-definite

4. While designing feedback system it is necessary to determine the system to be [ ]
   a) Controllable, observable b) uncontrollable, stable c) Stable, unobservable d) only stable

5. A Linear system which is uncontrollable can be stabilized by linear stable feedback. If system ___are stable [ ]
   a) Poles and zeros b) zeros c) Poles d) Eigen values

6. Linear time invariant system is described by the following equation [ ]
   a) d/dt(x(t))=Ax(t) + Bx(t) b) d/dt(u(t))=Ax(t) + Bu(t)
   c) d/dt(y(t))= Ax(t) + Bu(t) d) d/dt(u(t))=Ay(t) + bx(t)

7. A sufficient conditions that x* be relative minimum holds good for [ ]
   a) $\frac{\partial^2 f}{\partial x}$ / x* is a positive definite. b) $\frac{\partial^2 f}{\partial x}$ / x* is a positive indefinite
   c) $\frac{\partial^2 f}{\partial x}$/ x* is a negative definite d) $\frac{\partial^2 f}{\partial x}$ / x* is a negative indefinite

8. The interception of attacking aircraft and missiles is an example of [ ]
   a) State regulation problem b) Minimum time control problem
   c) Minimum energy problem d) tracking problem

9. In a minimum time problem the performance index to be minimized is [ ]
   a) $J = \int_{t_0}^{t_1} dt$ b) $J = \int_{t_0}^{t_1} u(t)\, dt$ c) $J = \int_{t_0}^{t_1} |u(t)|dt$ d) all the above

10. Which is true with respect to Pontryagin's minimum principle [ ]
    a) Formulation is easy b) actual computation is more difficult
    c) Control variable inequality constraints further add difficulties d) all the above

Cont.....2

II Fill in the Blanks:

11. The direct method of Lyapunov's provides _____ in case of linear systems.

12. The non-linear system is asymptotically stable at _____ if there exist a constant, positive definite and symmetric matrix.

13. The determination of stability around the choice of positive definite function V(x) is called _____ in the stability theorem.

14. Control variable in equality constraints add difficulties is valid with _____ minimum principle.

15. An alternative method of pole placement in case of multi-input system is to introduce a state _____

16. In reduced-order observer the state was derived by setting model of the plant and _____ to difference between actual and estimated output.

17. Euler-Lagrangian equation is _____.

18. The state constraints in control and state variable inequality constraints are of the form_____.

19. The equation to minimize the energy expenditure is _____.

20. The equation to determine tracking problem is _____.

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Code No: 58012 **Set No. 2**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV B.Tech. II Sem., II Mid-Term Examinations, April-2014
ADVANCED CONTROL SYSTEMS
Objective Exam

Name: _____ Hall Ticket No. | | | | | | A | | | | |

Answer All Questions. All Questions Carry Equal Marks. Time: 20 Min. Marks: 10.

I. Choose the correct alternative:

1. While designing feedback system it is necessary to determine the system to be [ ]
   a) Controllable, observable b) uncontrollable, stable c) Stable, unobservable d) only stable

2. A Linear system which is uncontrollable can be stabilized by linear stable feedback. If system ___are stable [ ]
   a) Poles and zeros b) zeros c) Poles d) Eigen values

3. Linear time invariant system is described by the following equation [ ]
   a) d/dt(x(t))=Ax(t) + Bx(t) b) d/dt(u(t))=Ax(t) + Bu(t)
   c) d/dt(y(t))= Ax(t) + Bu(t) d) d/dt(u(t))=Ay(t) + bx(t)

4. A sufficient conditions that x* be relative minimum holds good for [ ]
   a) $\frac{\partial^2 f}{\partial x}$ / x* is a positive definite. b) $\frac{\partial^2 f}{\partial x}$ / x* is a positive indefinite
   c) $\frac{\partial^2 f}{\partial x}$/ x* is a negative definite d) $\frac{\partial^2 f}{\partial x}$ / x* is a negative indefinite

5. The interception of attacking aircraft and missiles is an example of [ ]
   a) State regulation problem b) Minimum time control problem
   c) Minimum energy problem d) tracking problem

6. In a minimum time problem the performance index to be minimized is [ ]
   a) $J = \int_{t0}^{t1} dt$ b) $J = \int_{t0}^{t1} u(t)\, dt$ c) $J = \int_{t0}^{t1} |u(t)|dt$ d) all the above

7. Which is true with respect to Pontryagin's minimum principle [ ]
   a) Formulation is easy b) actual computation is more difficult
   c) Control variable inequality constraints further add difficulties d) all the above

8. Lyapunov's stability theorem satisfies the condition for a scalar function V(x) and some real number $\varepsilon > 0$; Lyapunov's stability theorem satisfies the properties for all x in the following region. [ ]
   a) $\|x\| > \varepsilon$ b) $\|x\| \leq \varepsilon$ c) $\|x\| \geq \varepsilon$ d) $\|x\| < \varepsilon$

9. The condition for globally asymptotically stable for all x, V (x) is radially unbounded. [ ]
   a) $V(x) \rightarrow \infty$ as $\|x\| \rightarrow \infty$ b) $V(x) \rightarrow 0$ as $\|x\| \rightarrow 0$
   c) $V(x) \rightarrow -\infty$ as $\|x\| \rightarrow \infty$ d) $V(x) \rightarrow 0$ as $\|x\| \rightarrow \infty$

10. A scalar function W (x) in the Lyapunov's Instability theorem must not be [ ]
    a) Positive semi-definite b) Negative semi-Indefinite
    c) Positive semi- Indefinite d) Negative semi-definite

Cont.....2

II Fill in the Blanks:

11. Control variable in equality constraints add difficulties is valid with _____ minimum principle.

12. An alternative method of pole placement in case of multi-input system is to introduce a state _____

13. In reduced-order observer the state was derived by setting model of the plant and _____ to difference between actual and estimated output.

14. Euler-Lagrangian equation is _____.

15. The state constraints in control and state variable inequality constraints are of the form_____.

16. The equation to minimize the energy expenditure is _____.

17. The equation to determine tracking problem is _____.

18. The direct method of Lyapunov's provides _____ in case of linear systems.

19. The non-linear system is asymptotically stable at _____ if there exist a constant, positive definite and symmetric matrix.

20. The determination of stability around the choice of positive definite function V(x) is called _____ in the stability theorem.

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Code No: 58012 **Set No. 3**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV B.Tech. II Sem., II Mid-Term Examinations, April-2014
ADVANCED CONTROL SYSTEMS
Objective Exam

Name: _____ **Hall Ticket No.** | | | | | | A | | | | |

Answer All Questions. All Questions Carry Equal Marks. Time: 20 Min. Marks: 10.

I. Choose the correct alternative:

1. Linear time invariant system is described by the following equation [ ]
   a) d/dt(x(t))=Ax(t) + Bx(t) b) d/dt(u(t))=Ax(t) + Bu(t)
   c) d/dt(y(t))= Ax(t) + Bu(t) d) d/dt(u(t))=Ay(t) + bx(t)

2. A sufficient conditions that x* be relative minimum holds good for [ ]
   a) $\frac{\partial^2 f}{\partial x}$ / x* is a positive definite. b) $\frac{\partial^2 f}{\partial x}$ / x* is a positive indefinite
   c) $\frac{\partial^2 f}{\partial x}$/ x* is a negative definite d) $\frac{\partial^2 f}{\partial x}$ / x* is a negative indefinite

3. The interception of attacking aircraft and missiles is an example of [ ]
   a) State regulation problem b) Minimum time control problem
   c) Minimum energy problem d) tracking problem

4. In a minimum time problem the performance index to be minimized is [ ]
   a) $J = \int_{t0}^{t1} dt$ b) $J = \int_{t0}^{t1} u(t)\, dt$ c) $J = \int_{t0}^{t1} |u(t)|dt$ d) all the above

5. Which is true with respect to Pontryagin's minimum principle [ ]
   a) Formulation is easy b) actual computation is more difficult
   c) Control variable inequality constraints further add difficulties d) all the above

6. Lyapunov's stability theorem satisfies the condition for a scalar function V(x) and some real number $\varepsilon > 0$; Lyapunov's stability theorem satisfies the properties for all x in the following region. [ ]
   a) II x II $> \varepsilon$ b) II x II $\leq \varepsilon$ c) II x II $\geq \varepsilon$ d) II x II $< \varepsilon$

7. The condition for globally asymptotically stable for all x, V (x) is radially unbounded. [ ]
   a) V (x) $\rightarrow \infty$ as II x II $\rightarrow \infty$ b) V (x) $\rightarrow 0$ as II x II $\rightarrow 0$
   c) V (x) $\rightarrow -\infty$ as II x II $\rightarrow \infty$ d) V (x) $\rightarrow 0$ as II x II $\rightarrow \infty$

8. A scalar function W (x) in the Lyapunov's Instability theorem must not be [ ]
   a) Positive semi-definite b) Negative semi-Indefinite
   c) Positive semi- Indefinite d) Negative semi-definite

9. While designing feedback system it is necessary to determine the system to be [ ]
   a) Controllable, observable b) uncontrollable, stable c) Stable, unobservable d) only stable

10. A Linear system which is uncontrollable can be stabilized by linear stable feedback. If system ___are stable [ ]
    a) Poles and zeros b) zeros c) Poles d) Eigen values

Cont.....2

II Fill in the Blanks:

11. In reduced-order observer the state was derived by setting model of the plant and _____ to difference between actual and estimated output.

12. Euler-Lagrangian equation is _____.

13. The state constraints in control and state variable inequality constraints are of the form_____.

14. The equation to minimize the energy expenditure is _____.

15. The equation to determine tracking problem is _____.

16. The direct method of Lyapunov's provides _____ in case of linear systems.

17. The non-linear system is asymptotically stable at _____ if there exist a constant, positive definite and symmetric matrix.

18. The determination of stability around the choice of positive definite function V(x) is called _____ in the stability theorem.

19. Control variable in equality constraints add difficulties is valid with _____ minimum principle.

20. An alternative method of pole placement in case of multi-input system is to introduce a state _____

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Code No: 58012 **Set No. 4**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV B.Tech. II Sem., II Mid-Term Examinations, April-2014
ADVANCED CONTROL SYSTEMS
Objective Exam

Name: _____ **Hall Ticket No.** | | | | | | A | | | | |

Answer All Questions. All Questions Carry Equal Marks. Time: 20 Min. Marks: 10.

I. Choose the correct alternative:

1. The interception of attacking aircraft and missiles is an example of [ ]
   a) State regulation problem b) Minimum time control problem
   c) Minimum energy problem d) tracking problem

2. In a minimum time problem the performance index to be minimized is [ ]
   a) $J = \int_{t0}^{t1} dt$ b) $J = \int_{t0}^{t1} u(t)\, dt$ c) $J = \int_{t0}^{t1} |u(t)|dt$ d) all the above

3. Which is true with respect to Pontryagin's minimum principle [ ]
   a) Formulation is easy b) actual computation is more difficult
   c) Control variable inequality constraints further add difficulties d) all the above

4. Lyapunov's stability theorem satisfies the condition for a scalar function V(x) and some real number $\varepsilon > 0$; Lyapunov's stability theorem satisfies the properties for all x in the following region. [ ]
   a) $\| x \| > \varepsilon$ b) $\| x \| \leq \varepsilon$ c) $\| x \| \geq \varepsilon$ d) $\| x \| < \varepsilon$

5. The condition for globally asymptotically stable for all x, V (x) is radially unbounded. [ ]
   a) $V(x) \rightarrow \infty$ as $\| x \| \rightarrow \infty$ b) $V(x) \rightarrow 0$ as $\| x \| \rightarrow 0$
   c) $V(x) \rightarrow -\infty$ as $\| x \| \rightarrow \infty$ d) $V(x) \rightarrow 0$ as $\| x \| \rightarrow \infty$

6. A scalar function W (x) in the Lyapunov's Instability theorem must not be [ ]
   a) Positive semi-definite b) Negative semi-Indefinite
   c) Positive semi- Indefinite d) Negative semi-definite

7. While designing feedback system it is necessary to determine the system to be [ ]
   a) Controllable, observable b) uncontrollable, stable c) Stable, unobservable d) only stable

8. A Linear system which is uncontrollable can be stabilized by linear stable feedback. If system ___are stable [ ]
   a) Poles and zeros b) zeros c) Poles d) Eigen values

9. Linear time invariant system is described by the following equation [ ]
   a) d/dt(x(t))=Ax(t) + Bx(t) b) d/dt(u(t))=Ax(t) + Bu(t)
   c) d/dt(y(t))= Ax(t) + Bu(t) d) d/dt(u(t))=Ay(t) + bx(t)

10. A sufficient conditions that x* be relative minimum holds good for [ ]
    a) $\frac{\partial^2 f}{\partial x}$ / x* is a positive definite. b) $\frac{\partial^2 f}{\partial x}$ / x* is a positive indefinite
    c) $\frac{\partial^2 f}{\partial x}$/ x* is a negative definite d) $\frac{\partial^2 f}{\partial x}$ / x* is a negative indefinite

Cont.....2

II Fill in the Blanks:

11. The state constraints in control and state variable inequality constraints are of the form_____.

12. The equation to minimize the energy expenditure is _____.

13. The equation to determine tracking problem is _____.

14. The direct method of Lyapunov's provides _____ in case of linear systems.

15. The non-linear system is asymptotically stable at _____ if there exist a constant, positive definite and symmetric matrix.

16. The determination of stability around the choice of positive definite function V(x) is called _____ in the stability theorem.

17. Control variable in equality constraints add difficulties is valid with _____ minimum principle.

18. An alternative method of pole placement in case of multi-input system is to introduce a state _____

19. In reduced-order observer the state was derived by setting model of the plant and _____ to difference between actual and estimated output.

20. Euler-Lagrangian equation is _____.

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