CONTROL ENGINEERING

By Prof. Hitesh Dholakiya

Engineering Funda

MCQ FOR COMPETITVE EXAMINATIONS

SSASIT, SURAT

1) Which system exhibits the initiation of corrective action only after the output gets affected?

a. Feed forward

b. Feedback

c. Both a and b

d. None of the above

ANSWER: Feedback

2) What should be the nature of bandwidth for a good control system?

a. Large

b. Small

c. Medium

d. All of the above

ANSWER: Large

3) If an impulse response of a system is e^{-5t}, what would be its transfer function?

a. 1/ s - 5

b. 1/ s + 5

c. (s+1) / (s+5)

d. $(s^2 - 5s)/ (s-5)$

ANSWER: 1/ s + 5

4) Which among the following are the elements of rotational motion?

a. Mass, Spring, Friction

b. Inertia, Damper, Spring

c. Work, Energy, Power

d. Force, Pressure, Viscocity

ANSWER: Inertia, Damper, Spring

5) Match the following notations with their meanings:
A. G(s) ---------- 1) Laplace of error signal
B. H(s) ---------- 2) Laplace of output signal
C. C(s) ---------- 3) Forward transfer function
D. E(s) ---------- 4) Feedback transfer function

a. A- 2, B- 3, C- 1, D- 4

b. A- 3, B- 4, C- 2, D- 1

c. A- 2, B- 3, C- 4, D- 1

d. A- 1, B- 2, C- 3, D- 4

ANSWER: A- 3, B- 4, C- 2, D- 1

6) At summing point, more than one signal can be added or _____

a. Subtracted

b. Multiplied

c. Both a and b

d. None of the above

ANSWER: Subtracted

7) The value of variables at each node is _____the algebraic sum of all signals arriving at that node.

a. Less than

b. Equal to

c. Greater than

d. None of the above

ANSWER: Equal to

8) In signal flow graph, the product of all _____gains while going through a forward path is known as 'Path gain'.

a. Branch

b. Path

c. Node

d. Loop

ANSWER: Branch

9) If a type 1 system is subjected to parabolic input, what will be the value of steady state error?

a. 0

b. 100

c. Constant k

d. Infinite

ANSWER: Infinite

10) On which factor does the steady state error of the system depend?

a. Order

b. Type

c. Size

d. Prototype

ANSWER: Type

11) Consider the equation $S^3 + 3s^2 + 5s + 2 = 0$. How many roots are located in left half of s-plane?

a. Zero

b. Two

c. Three

d. Four

ANSWER: Three

12) If the system is represented by characteristic equation $s^6 + s^4 + s^3 + s^2 + s + 3 = 0$, then the system is_____

a. Stable

b. Unstable

c. Marginally stable

d. Unpredictable

ANSWER: Unstable

13) If poles are added to the system, where will the system tend to shift the root locus?

a. To the left of an imaginary axis

b. To the right of an imaginary axis

c. At the center

d. No shifting takes place

ANSWER: To the right of an imaginary axis

14) For a unity feedback system with $G(s) = 10 / s^2$, what would be the value of centroid?

a. 0

b. 2

c. 5

d. 10

ANSWER: 0

15) If 'ξ' approaches to zero, the peak resonance would _____

a. Also be zero

b. Be unity

c. Tend to infinity

d. Become equal to peak overshoot

ANSWER: Tend to infinity

16) At which condition of 'ξ', resonant peak does not exist and its maximum value is considered to be unity along with zero resonant frequency?

a. $0 < \xi < 0.707$

b. $\xi > 0.707$

c. $\xi = 0$

d. $\xi = 1$

ANSWER: $\xi > 0.707$

17) If the damping of the system becomes equal to zero, which condition of the resonant frequency is likely to occur?

a. $\omega_r = \omega_d$

b. $\omega_r > \omega_n$

c. $\omega_r < \omega_n$

d. $\omega_r = \omega_n$

ANSWER: $\omega_r = \omega_n$

18) If the resonant peak is estimated to be '5', which among the following would be the correct value of damping?

a. $\xi = 0.3$

b. $\xi = 1$

c. $\xi = 3.2$

d. $\xi = 5.55$

ANSWER: $\xi = 0.3$

19) If a system is said to have a damping $\xi = 0.5532$ with the natural frequency $\omega_n = 2$ rad/sec, what will be the value of resonant frequency (ω_r)?

a. 1.2456 rad/s

b. 1.7352 rad/s

c. 2.3421 rad/s

d. 3.66 rad/s

ANSWER: 1.2456 rad/s

20) In frequency response, the resonance frequency is basically a measure of _____ of response.

a. Speed

b. Distance

c. Angle

d. Curvature

ANSWER: Speed

21) The frequency at which the phase of the system acquires ____ is known as 'Phas crossover frequency'.

a. 90°

b. -90°

c. 180°

d. -180°

ANSWER: -180°

22) At which frequency does the magnitude of the system becomes zero dB?

a. Resonant frequency

b. Cut-off frequency

c. Gain crossover frequency

d. Phase crossover frequency

ANSWER: Gain crossover frequency

23) If the phase angle at gain crossover frequency is estimated to be -105°, what will be the value of phase margin of the system?

a. 23°

b. 45°

c. 60°

d. 75°

ANSWER: 75°

24) The system is said to be marginally stable, if gain margin is _____

a. 0

b. 1

c. +∞

d. None of the above

ANSWER: +∞

25) If the constant 'k' is positive, then what would be its contribution on the phase plot?

a. 0°

b. 45°

c. 90°

d. 180°

ANSWER: 0°

26) If the unity feedback system is given by the open loop transfer function $G(s) = ks^2 / [(1 + 0.3s) (1+ 0.05s)]$, what would be the initial slope of magnitude plot?

a. 20 dB/decade

b. 40 dB/decade

c. 60 dB/decade

d. Unpredictable

ANSWER: 40 dB/decade

27) If the system is represented by $G(s) H(s) = k (s+7) / s (s +3) (s + 2)$, what would be its magnitude at $\omega = \infty$?

a. 0

b. ∞

c. 7/10

d. 21

ANSWER: 0

28) According to Nyquist stability criterion, where should be the position of all zeros of q(s) corresponding to s-plane?

a. On left half

b. At the center

c. On right half

d. Random

ANSWER: On left half

29) Consider a feedback system with gain margin of about 30. At what point does Nyquist plot crosses negative real axis?

a. -3

b. -0.3

c. -30

d. -0.03

ANSWER: -0.3

30) For Nyquist contour, the size of radius is _____

a. 25

b. 0

c. 1

d. ∞

ANSWER: ∞

31) If a Nyquist plot of G (jω) H (jω) for a closed loop system passes through (-2, j0) point in GH plane, what would be the value of gain margin of the system in dB?

a. 0 dB

b. 2.0201 dB

c. 4 dB

d. 6.0205 dB

ANSWER: 6.0205 dB

32) Which principle specifies the relationship between enclosure of poles & zeros by s-plane contour and the encirclement of origin by q(s) plane contour?

a. Argument

b. Agreement

c. Assessment

d. Assortment

ANSWER: Argument

33) Which among the following constitute the state model of a system in addition to state equations?

a. Input equations

b. Output equations

c. State trajectory

d. State vector

ANSWER: Output equations

34) State model representation is possible using _____

a. Physical variables

b. Phase variables

c. Canonical state variables

d. All of the above

ANSWER: All of the above

35) Which mechanism in control engineering implies an ability to measure the state by taking measurements at output?

a. Controllability

b. Observability

c. Differentiability

d. Adaptability

ANSWER: Observability

36) According to the property of state transition method, e^0 is equal to _____

a. I

b. A

c. e^{-At}

d. $-e^{At}$

ANSWER: I

37) Which among the following is a disadvantage of modern control theory?

a. Implementation of optimal design

b. Transfer function can also be defined for different initial conditions

c. Analysis of all systems take place

d. Necessity of computational work

ANSWER: Necessity of computational work

38) Which among the following is a unique model of a system?

a. Transfer function

b. State variable

c. Both a and b

d. None of the above

ANSWER: Transfer function

1) Which among the following controls the speed of D.C. motor?
a. Galvanometer
b. Gauss meter
c. Potentiometer
d. Tachometer

ANSWER: Tachometer

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2) Into which energy signal does the position sensor convert the measured position of servomotor in servomechanisms?
a. Mechanical
b. Electrical
c. Thermal
d. Light

ANSWER: Electrical

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3) What is the value of steady state error in closed loop control systems?
a. Zero
b. Unity
c. Infinity
d. Unpredictable

ANSWER: Zero

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4) A good control system should be sensitive to _____
a. Internal disturbances
b. Environmental parameters
c. Parametric variations
d. Input signals (except noise)

ANSWER: Input signals (except noise)

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5) For the transfer function given below, where does the zero of the system lie?
G(s) = 5s -1 / s^2 + 5s + 4
a. s = -1 & s = -1/4
b. s = -4 & s = -1
c. s = 1/5
d. s = -1/5

ANSWER: s = 1/5

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6) If a signal is passed through an integrator, it _____the amplitude of noise signal.
a. Enhances
b. Reduces
c. Stabilizes
d. Factorizes

ANSWER: Reduces

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7) Laplace transform of an impulse response is regarded as _____function of the system
a. Analytic
b. Parabolic
c. Transfer
d. Hypothetical

ANSWER: Transfer

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8) The fundamental function of a tachometer is the conversion of angular _____ into voltage
a. Velocity
b. Displacement
c. Acceleration
d. Current

ANSWER: Velocity

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9) If finite number of blocks are connected in series or cascade configuration, then how are the blocks combined algebraically?
a. By addition
b. By multiplication
c. By differentiation
d. By integration

ANSWER: By multiplication

---

10) Associative law for summing point is applicable only to those summing points which are _____connected to each other.
a. Directly
b. Indirectly
c. Orthogonally
d. Diagonally

ANSWER: Directly

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11) For the elimination of feedback loops, the derivation based on transfer function of _____ loop is used.
a. Open
b. Closed
c. Both a and b
d. None of the above

ANSWER: Closed

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12) In block diagram representation, what do the lines connecting the blocks, known as?
a. Branches
b. Nodes
c. Datums
d. Sources

ANSWER: Branches

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13) In a signal flow graph method, how is an overall transfer function of a system obtained?
a. Poisson's equation
b. Block diagram reduction rules
c. Mason's equation
d. Lagrange's equation

ANSWER: Mason's equation

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14) While solving signal flow graph using Mason's gain equation, what does the second letter in two subscript notation of 'L' stand for?
a. Serial number of loop
b. Parallel number of loop
c. Number of touching loops
d. Number of non-touching loops

ANSWER: Number of non-touching loops

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15) For which systems are the signal flow graphs applicable?
a. Causal
b. Invertible
c. Linear time invariant system
d. Dynamic

ANSWER: Linear time invariant system

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16) Two loops are said to be non-touching only if no common _____exists between them.
a. Loop
b. Feedback path
c. Branch
d. Node

ANSWER: Node

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17) In time domain system, which response has its existence even after an extinction of transient response?
a. Step response
b. Impulse response
c. Steady state response
d. All of the above

ANSWER: Steady state response

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18) Which among the following is represented by a parabolic input signal?
a. Position
b. Force
c. Velocity
d. Acceleration

ANSWER: Acceleration

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19) Type 0 systems are unsuitable _____
a. For ramp inputs
b. If the input is parabolic in nature
c. Both a and b
d. None of the above

ANSWER: Both a and b

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20) If a type 0 system is subjected to step input, what is its effect on steady state error?
a. It increases continuously
b. It remains constant
c. It decreases monotonically
d. It gets subjected to another input

ANSWER: It remains constant

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21) Consider that the pole is located at origin and its laplace representation is 1/s. What would be the nature of pole response?
a. Rising exponential
b. Decaying exponential
c. Sinusoidal
d. Constant value

ANSWER: Constant value

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22) In accordance to relative stability, the settling time exhibits inversely proportional nature to _____parts of roots
a. Real positive
b. Real negative
c. Imaginary positive
d. Imaginary negative

ANSWER: Real negative

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23) In Routh array, if zero is found in the first column, then by which term it needs to be replaced?
a. δ
b. η
c. σ
d. ε

ANSWER: ε

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24) In a second order system, if the damping ratio is greater than equal to '1', then what would be the nature of roots?
a. Imaginary
b. Real and equal
c. Real but not equal
d. Complex conjugate

ANSWER: Real but not equal

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25) For drawing root locus, the angle of asymptote yields the direction along which _____branches approach to infinity.
a. p + z
b. p - z
c. p / z
d. p x z

ANSWER: p - z

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26) Which point on root locus specifies the meeting or collision of two poles?
a. Centroid
b. Break away point
c. Stability point
d. Anti-break point

ANSWER: Break away point

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27) What should be the nature of root locus about the real axis?
a. Assymetric
b. Symmetric
c. Exponential
d. Decaying

ANSWER: Symmetric

---

28) If the system is specified by open loop transfer function G(s)H(s) = k / s(s+3) (s + 2), how many root loci proceed to end at infinity?
a. 2
b. 3
c. 5
d. 6

ANSWER: 3

---

29) Which plots in frequency domain represent the two separate plots of magnitude and phase against frequency in logarithmic value?
a. Polar plots
b. Bode plots
c. Nyquist plots
d. All of the above

ANSWER: Bode plots

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30) How is the sinusoidal transfer function obtained from the system transfer function in frequency domain?
a. Replacement of 'jω' by 's'
b. Replacement of 's' by 'ω'
c. Replacement of 's' by 'jω'
d. Replacement of 'ω' by 's'

ANSWER: Replacement of 's' by 'jω'

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31) According to the principle of log-scales, if the ratio between two points is same, then the two points get _____equally.
a. United
b. Separated
c. Multiplexed
d. Mixed

ANSWER: Separated

---

32) If a pole is located at origin, how does it get represented on the magnitude plot?
a. -10 log (ω) dB
b. -20 log (ω) dB
c. -40 log (ω) dB
d. -60 log (ω) dB

ANSWER: -20 log (ω) dB

---

33) Due to an addition of pole at origin, the polar plot gets shifted by ___ at ω = 0?
a. -45°
b. -60°
c. -90°
d. -180°

ANSWER: -90°

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34) Consider the system represented by the equation given below. What would be the total phase value at ω = 0?
200/ [s^3 (s + 3) (s + 6) (s + 10)]
a. -90°
b. -180°
c. -270°
d. -360°

ANSWER: -270°

---

35) Which among the following are the interconnected units of state diagram representation?
a. Scalars
b. Adders
c. Integrators
d. All of the above

ANSWER: All of the above

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36) Which among the following plays a crucial role in determining the state of dynamic system?
a. State variables
b. State vector
c. State space
d. State scalar

ANSWER: State variables

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37) In P-D controller, the derivative action plays a significant role in increasing _____ of response.
a. Time
b. Distance
c. Speed
d. Volume

ANSWER: Speed

---

38) In addition to storage instructions, PLC controls _____
a. Logic sequence timing
b. Counting
c. Arithmetic operations
d. All of the above

ANSWER: All of the above

---

39) Which is the correct sequence of operational steps necessary for proper operation of an elevator (lift) control mechanism?
1. Up switch
2. Stop switch
3. Down switch
4. Start switch

a. 1-2-3-4
b. 2-1-4-3
c. 4-2-1-3
d. 3-1-2-4

ANSWER: 4-2-1-3

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40) How many digital inputs are present in PLCs?
a. 4
b. 8
c. 16
d. 32

ANSWER: 16

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1) Which terminology deals with the excitation or stimulus applied to the system from an external source for the generation of an output?
a. Input signal
b. Output signal
c. Error signal
d. Feedback signal

ANSWER: Input signal

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2) Which among the following is not an advantage of an open loop system?
a. Simplicity in construction & design
b. Easy maintenance
c. Rare problems of stability
d. Requirement of system recalibration from time to time

ANSWER: Requirement of system recalibration from time to time

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3) Which notation represents the feedback path in closed loop system representation?
a. b(t)
b. c(t)
c. e(t)
d. r(t)

ANSWER: b(t)

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4) Which among the following represents an illustration of closed loop system?
a. Automatic washing machine
b. Automatic electric iron
c. Bread toaster
d. Electric hand drier

ANSWER: Automatic electric iron

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5) How is an output represented in the control systems?
a. r(t)
b. c(t)
c. x(t)
d. y(t)

ANSWER: c(t)

---

6) The output is said to be zero state response because _____conditions are made equal to zero.
a. Initial
b. Final
c. Steady state
d. Impulse response

ANSWER: Initial

---

7) Basically, poles of transfer function are the laplace transform variable values which causes the transfer function to become _____
a. Zero
b. Unity
c. Infinite
d. Average value

ANSWER: Infinite

---

8) By equating the denominator of transfer function to zero, which among the following will be obtained?
a. Poles
b. Zeros
c. Both a and b
d. None of the above

ANSWER: Poles

---

9) The output signal is fed back at the input side from the _____point
a. Summing
b. Differential
c. Take-off
d. All of the above

ANSWER: Take-off

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10) In a parallel combination, the direction of flow of signals through blocks in parallel must resemble to the main _____
a. Forward
b. Feedback
c. Opposite
d. Diagonal

ANSWER: Forward

---

11) While shifting a take-off point after the summing point, which among the following should be added?
a. Summing point in series with take-off point
b. Summing point in parallel with take-off point
c. Block of reciprocal transfer function
d. Block of inverse transfer function

ANSWER: Summing point in series with take-off point

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12) Consider the assertions related to block diagram. Which among them represents the precise condition?
A. Block diagram is used for analysis & design of control system.
B. Block diagram also provides the information regarding the physical construction of the system.
a. A is true, B is false
b. A is false, B is true
c. Both A & B are true
d. Both A & B are false

ANSWER: A is true, B is false

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13) In a signal flow graph, nodes are represented by small _____
a. Circles
b. Squares
c. Arrows
d. Pointers

ANSWER: Circles

---

14) According to signal flow graph, which among the following represents the relationship between nodes by drawing a line between them?
a. Branch
b. Self-loop
c. Semi-node
d. Mesh

ANSWER: Branch

---

15) Which type of node comprises incoming as well as outgoing branches?
a. Source node
b. Sink node
c. Chain node
d. Main node

ANSWER: Chain node

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16) Where are the dummy nodes added in the branch with unity gain?
a. At input & output nodes
b. Between chain nodes
c. Both a and b
d. None of the above

ANSWER: At input & output nodes

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17) According to the property of impulse test signal, what is the value of an impulse at t = 0?
a. Zero
b. Unity
c. Infinite
d. Unpredictable

ANSWER: Infinite

---

18) What is the value of parabolic input in Laplace domain?
a. 1
b. A/s
c. A/s^2
d. A/s^3

ANSWER: A/s^3

---

19) Which among the following is/are an/the illustration/s of a sinusoidal input?
a. Setting the temperature of an air conditioner
b. Input given to an elevator
c. Checking the quality of speakers of music system
d. All of the above

ANSWER: Checking the quality of speakers of music system

---

20) If a system is subjected to step input, which type of static error coefficient performs the function of controlling steady state error?
a. Position
b. Velocity
c. Acceleration
d. Retardation

ANSWER: Position

---

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c. Infinite
d. Unpredictable

ANSWER: Infinite

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d. A/s^3

ANSWER: A/s^3

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ANSWER: Checking the quality of speakers of music system

---

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a. Position
b. Velocity
c. Acceleration
d. Retardation

ANSWER: Position

---

21) On the basis of an output response, into how many parts can the s-plane be divided?
a. 2
b. 3
c. 4
d. 6

ANSWER: 3

---

22) If the complex conjugate poles are located at RHP, what would be the nature of corresponding impulse response?
a. Exponential
b. Damping oscillations
c. Increasing amplifier
d. Constant amplitude oscillations

ANSWER: Increasing amplifier

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23) Which among the following are solely responsible in determining the speed of response of control system?
a. Poles
b. Zeros
c. Speed of input
d. All of the above

ANSWER: Poles

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24) If a pole is located at s = -5 in left-hand plane (LHP), how will it be represented in Laplace domain?
a. 1/ s + 5
b. 1/ s - 5
c. s/ s + 5
d. s/ s - 5

ANSWER: 1/ s + 5

---

25) In second order system, which among the following remains independent of gain (k)?
a. Open loop poles
b. Closed loop poles
c. Both a and b
d. None of the above

ANSWER: Open loop poles

26) Root locus specifies the movement of closed loop poles especially when the gain of system _____
a. Remains constant
b. Exhibit variations
c. Gives zero feedback
d. Gives infinite poles

ANSWER: Exhibit variations

27) Which condition is used to verify the existence of a particular point on the root locus?
a. Amplitude
b. Frequency
c. Magnitude
d. Angle

ANSWER: Angle

28) While specifying the angle and magnitude conditions, angles are added whereas magnitudes get _____
a. Subtracted
b. Multiplied
c. Divided
d. All of the above

ANSWER: Multiplied

29) The magnitude & phase relationship between _____input and the steady state output is called as frequency domain.
a. Step
b. Ramp
c. Sinusoidal
d. Parabolic

ANSWER: Sinusoidal

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30) If a linear system is subjected to an input r(t) = Asin(ωt), what output will be generated?
a. c(t) = B sin (ωt + Φ)
b. c(t) = B cos (ωt + Φ)
c. c(t) = B tan (ωt + Φ)
d. c(t) = B cot (ωt + Φ)

ANSWER: c(t) = B sin (ωt + Φ)

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31) Which unit is adopted for magnitude measurement in Bode plots?
a. Degree
b. Decimal
c. Decibel
d. Deviation

ANSWER: Decibel

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32) In an octave frequency band, the ratio of f_2 / f_1 is equivalent to _____
a. 2
b. 4
c. 8
d. 10

ANSWER: 2

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33) In polar plots, what does each and every point represent w.r.t magnitude and angle?
a. Scalar
b. Vector
c. Phasor
d. Differentiator

ANSWER: Phasor

---

34) In polar plots, if a pole is added at the origin, what would be the value of the magnitude at Ω = 0?
a. Zero
b. Infinity
c. Unity
d. Unpredictable

ANSWER: Infinity

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35) Conventional control theory is applicable to _____ systems
a. SISO
b. MIMO
c. Time varying
d. Non-linear

ANSWER: SISO

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36) State space analysis is applicable even if the initial conditions are _____
a. Zero
b. Non-zero
c. Equal
d. Not equal

ANSWER: Non-zero

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37) If an error signal e(t) of an ON-OFF controller is found to be greater than zero, what would be its output?
a. 10%
b. 50%
c. 80%
d. 100%

ANSWER: 100%

---

38) Which time is responsible for introducing an error in the temperature regulation of applications associated with ON-OFF controllers?
a. Rise time
b. Dead time
c. Switching time
d. Decay time

ANSWER: Dead time

---

39) Which controller has the potential to eliminate/overcome the drawback of offset in proportional controllers?
a. P-I
b. P-D
c. Both a and b
d. None of the above

ANSWER: P-I

---

40) In P-I controller, what does an integral of a function compute?
a. Density of curve
b. Area under the curve
c. Volume over the curve
d. Circumference of curve

ANSWER: Area under the curve

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1) Lowest critical frequency is due to pole and it may be present origin or nearer to origin, then it is which type of network?

A [ ]) LC

B [ ]) RL

C [v]) RC

D [ ]) Any of the above

2) Lowest critical frequency is due to zero and it may be present origin or nearer to origin, then it is which type of network?

A [ ]) LC network

B [ ]) RC network

C [ ]) RLC network

D [v]) RL network

3) Poles and zeros are arranged alternatively on negative real axis, then type of network is/are

A [ ]) LC network

B [ ]) RC network

C [ ]) RL network

D [v]) Both A and B

4) A box which tell the effect of inputs on control sub system is known as

A [ ]) Data Box

B [ ]) Logical box

C [v]) Decision box

D [ ]) State box

5) Which system is also known as automatic control system?

A [ ]) open loop control system

B [v]) closed loop control system

C [ ]) either A or B

D [ ]) nether A nor B

6) Advantages of open loop system is/are?

A [ ]) simple and economical

B [ ]) accurate

C [ ]) reliable

D [v]) all of the above

7) Which of the following are the disadvantages of a closed loop control system?

A [ ]) reduces the overall gain

B [ ]) complex and costly

C [ ]) oscillatory response

D [v]) all of the above

8) The output of the system has an effect upon the input quantity, then the system is a

A [ ]) open loop control system

B [v]) closed loop control system

C [ ]) either A or B

D [ ]) none of the above

9) By using which of the following elements, mechanical translational systems are obtained?

A [ ]) mass element

B [ ]) spring element

C [ ]) dash-pot

D [v]) all of the above

10) Force balancing equation of a mass elements is (where x = displacement)

A [v]) M d^2x/dt^2

B [ ]) M dx/dt

C [ ]) M *x

D [ ]) any of the above

11) Force balancing equation of a dash-pot elements is (where x = displacement)

A [ ]) B d^2x/dt^2

B [v]) B dx/dt

C [ ]) B *x

D [ ]) none of the above

12) Force balancing equation for elastic element (K) is (where x = displacement)

A [ ]) K d^2x/dt^2

B [ ]) K dx/dt

C [v]) K *x

D [ ]) none of the above

13) Which of the following is the analogous quantity for mass element in force-voltage analogy?

A [ ]) resistance

B [v]) inductance

C [ ]) capacitance

D [ ]) all of the above

14) Electrical analogous quantity for spring element (K) in force-voltage analogy is

A [ ]) L

B [ ]) R

C [v]) 1/C

D [ ]) C

15) In force-current analogy, electrical analogous quantity for displacement (x) is

A [ ]) voltage

B [ ]) inductance

C [ ]) capacitance

D [v]) flux

16) Electrical analogous quantity for dash-pot in force-current analogy is

A [ ]) resistance

B [v]) conductance

C [ ]) inductance

D [ ]) capacitance

17) If a circuit consisting of two mass elements, two spring elements and four friction elements. Find the order of transfer function?

A [v]) 2

B [ ]) 4

C [ ]) 1

D [ ]) 6

E [ ]) HINTS- order of transfer function is "2*n". Therefore, from given data, number of mass element = 2 Order of transfer function = 2*2 = 4

18) If two blocks having gains A and B respectively are in series connection, find the resultant gain using block diagram reduction technique?

A [ ]) A+B

B [v]) A*B

C [ ]) A-B

D [ ]) A/B

19) In signal flow graph input node is node having only----------

A [ ]) incoming branches

B [v]) outgoing branches

C [ ]) both 1 and 2

D [ ]) none of the above

20) When writing a transfer function which of the following loops are not valid loops?

A [v]) self loops at input node

B [ ]) self loops at output node

C [ ]) both A and B

D [ ]) nether A nor B

21) Which of the following id the electrical analogous element for displacement in force-voltage analogy?

A [ ]) flux

B [ ]) voltage

C [v]) charge

D [ ]) current

22) If two blocks having gains A and B respectively are in parallel connection, find the resultant gain using block diagram reduction technique?

A [v]) A+B

B [ ]) A*B

C [ ]) A/B

D [ ]) 2(A+B)

23) Which of the following is/are the characteristics of negative feedback control system?

A [ ]) Low sensitivity to parameter variations

B [ ]) Reduction in gain at the expense of better stability

C [ ]) Rejection of disturbance signals

D [v]) all of the above

24) Which of the following combinations is/are correct electrical analogous elements in force-current analogy?

A [ ]) Velocity (v) ---------- Voltage (V)

B [ ]) Force (f) ---------- Current (i)

C [ ]) Spring element (K) --------- Inverse inductance (1/L)

D [v]) all of the above

25) In signal flow graph output node is node having only----------

A [v]) incoming branches

B [ ]) outgoing branches

C [ ]) both A and B

D [ ]) none of the above

26) The transfer function for tachometer E(S)/θ(S) is

A [ ]) K

B [v]) KS

C [ ]) K/S

D [ ]) KS^2

27) Transient state analysis deals with ----------

A [ ]) magnitude of error

B [v]) nature of response

C [ ]) both A and B

D [ ]) none of the above

28) Open loop transfer function, G(s)=s-2/s+2 is a

A [v]) all pass filter.

B [ ]) band stop filter.

C [ ]) band reject filter

D [ ]) non of above.

29) When compared a 1st order LPF with a 2nd order LPF has

A [ ]) lower voltage gain.

B [ ]) higher voltage gain.

C [v]) higher cut off frequency.

D [ ]) faster drop in filter response.

30) The type of a control system is obtained from ---------- transfer function?

A [v]) open loop

B [ ]) closed loop

C [ ]) either A or B

D [ ]) nether A nor B

31) What is the type of closed loop system for the plant transfer function $G(s) = k/s^2(1+Ts)$ and with unity feedback?

A [ ]) 1

B [v]) 2

C [ ]) 4

D [ ]) 5

32) Which of the following statement is/are true statements?

A [ ]) Type of the system is obtained from open loop transfer function

B [ ]) The steady state analysis depends on type of the system

C [ ]) Transient state analysis depends on order of the system

D [v]) all of the above

33) What is the order of closed loop system for the plant transfer function $G(s) = k/s^2(1+Ts)$ and with unity feedback

A [v]) 3

B [ ]) 1

C [ ]) 0

D [ ]) 4

34) A second order control system is defined by the following equation: $4\,d^2c(t)/dt^2 + 8\,dc(t)/dt + 16\,c(t) = 16\,u(t)$ The damping ratio and natural frequency for this system are respectively

A [ ]) 0.25 and 2 rad/s

B [ ]) 0.25 and 4 rad/s

C [v]) 0.50 and 2 rad/s

D [ ]) 0.50 and 4 rad/s

E [ ]) HINTS-The standard second order expression in terms of damping ratio (ξ) and natural frequency (ωn) is as follows. $C(s)/R(s) = (\omega^2 n)/(s^2 + 2\zeta(\omega n)s + \omega^2 n)$ Given second order system is $C(s)/U(s) = 16/(4s^2 + 8s + 16) = 4/(s^2 + 2s + 4)$ Therefore, comparing above two equations, Natural frequency = 2 rad/s Damping ratio = 0.5

35) The steady state error due to ramp input for a type two system is equal to

A [v]) zero

B [ ]) infinite

C [ ]) non zero number

D [ ]) constant

36) Differentiation of parabolic response is a ---------- response?

A [ ]) parabolic

B [v]) ramp

C [ ]) step

D [ ]) impulse

E [ ]) HINTS-differentiation of parabolic response gives the ramp response. d(Parabolic response)/dt = Ramp response d(Ramp response)/dt = Step response d(step response)/dt = Impulse response

37) Weighting function is in terms of ----------

A [ ]) Laplace transforms of step response

B [ ]) Laplace transforms of ramp response

C [ ]) Laplace transforms of parabolic response

D [v]) Laplace transforms of parabolic response

38) The impulse response of a system is c(t) = -te-t + 2 e-t (t>0). Its closed loop transfer function is

A [ ]) $(2s+1)/s^2$

B [v]) $(2s+1)/(s+1)^2$

C [ ]) $(2s+2)/(s+1)^2$

D [ ]) $(2s+2)/s^2$

39) What is the open loop DC gain of a unity feedback control system having closed loop transfer function is $(s + 4)/(s^2 + 7s +13)$?

A [ ]) 4/13

B [ ]) 13/4

C [ ]) 9/4

D [v]) 4/9

E [ ]) HINTS-Closed loop transfer function = $G(s)/(1+G(s)H(s)) = (s + 4)/(s^2 + 7s +13)$ Given system is a unity feedback control system, Open loop transfer function $G(s) = (s + 4)/(s^2 + 7s +13 - (s+4))$ $G(s) = (s + 4)/(s^2 + 6s + 9)$ For DC gain AC terms should be zero, i.e., s = 0 Therefore, open loop DC gain G(s) = 4/9

40) The impulse response of a system is c(t) = -te-t + 2 e-t (t>0). Its open loop transfer function is

A [v]) $(2s+1)/s^2$

B [ ]) $(2s+1)/(s+1)^2$

C [ ]) $(2s+2)/(s+1)^2$

D [ ]) $(2s+2)/s^2$

E [ ]) HINTS-L(Impulse response) = Transfer function C(S) = Transfer function = $(2s+1)/(s+1)^2$ G (s)/(1 + G(s) H(s)) = $(2s+1)/(s+1)^2$ Open loop transfer function G(S) = $(2s+1)/((s+1)^2 - (2s+1))$ G(s) = $(2s+1)/s^2$

41) A certain control system has input u(t) and out put c(t). If the input is first passed through a block having transfer function e-s and the applied to the system. The modified output will be

A [ ]) c(t-1).u(t)

B [v]) c(t-1).u(t-1)

C [ ]) c(t).u(t-1)

D [ ]) c(t)u(t)

E [ ]) HINTS-Let F(s) is block gain, then C(s) = F(s).R(s) If the input passed through a block having transfer function e-s Cm(s) = R(s).e-s.F(s) Cm(s) = C(s).e-s By taking inverse Laplace transforms Cm(t) = c(t-1).u(t-1)

42) Lead compensator is used to improve ----------

A [v]) transient response

B [ ]) steady state response

C [ ]) both A and B

D [ ]) none of the above

43) Adding a pole to a system transfer function in terms of compensator represents a ---------- compensator ?

A [ ]) Lead

B [v]) Lag

C [ ]) Lead-Lag

D [ ]) Lag-lead

44) A linear time invariant system, initially at rest when subjected to a unit step input gave response c(t) = te-t (t ≥ 0). The transfer function of the system is

A [v]) $1/s(s+1)^2$

B [ ]) $(s+1)^2/s$

C [ ]) $s/(s+1)$

D [ ]) $s/(s+1)^2$

E [ ]) HINTS-Transfer function = C(s)/R(s) Output response C(t) = te-t (t ≥ 0) $C(s) = 1/(s+1)^2$ Given input r(t) is a step input. R(s) = 1/s Therefore, transfer function = C(s)/R(s) = $1/s(S+1)^2$

45) Given the transfer function $G(s) = 121/(s^2 + 13.2s + 121)$ of a system. Which of the following characteristics does it have?

A [ ]) Over damped

B [ ]) Critical damped

C [v]) Under damped

D [ ]) any of the above

E [ ]) HINTS-Compare given transfer function with standard second order transfer function, $\omega n = \sqrt{121} = 11$ rad/s $2\zeta(\omega n) = 13.2$ $\xi = 13.2/(2*11) = 0.6$ $\xi < 1$ Therefore given system is a under damped system.

46) Consider a network function H(s) = 2(s+3)/((s+2)(s+4)). What is the steady state response due to step input?

A [ ]) 4/3

B [ ]) 1/2

C [ ]) 1

D [v]) 3/4

E [ ]) HINTS-Steady state value can be obtained by applying final value theorem to the function. $Lim_{s\to 0} C(s) = Lim_{s\to 0} R(s)H(s)$ Where, C(s) = Steady state value R(s) = Input H(s) = Network response Steady state value = $Lim_{s\to 0} *2(s+3)/((s+2)(s+4))*1/s = 3/4$

47) Given a unity feedback system with G(s) = k/s(s+4), the value of k for damping ratio of 0.5 is

A [ ]) 1

B [ ]) 4

C [v]) 16

D [ ]) 64

E [ ]) HINTS-Characteristic equation is $s^2 + 4s + k = 0$ Compared to second ordered standard characteristic equation, Natural frequency $\omega n = \sqrt{k}$ $2\xi\omega n = 4$ Given $\xi = 0.5$ $\omega n = 4 = \sqrt{k}$ Therefore, k = 16

48) For type 1 system with parabolic input, the steady state error is

A [ ]) zero

B [ ]) finite constant

C [v]) infinite

D [ ]) indeterminate

49) The transfer function of two compensator are given below C1=10(s+1)/s+10 and C2=s+10/10(s+1) which one is correct?

A [ ]) C1 is a lag compensator and C2 is a lead compensator.

B [v]) C1 is a lead compensator and C2 is a lag compensator.

C [ ]) Both C1 and C2 are lead compensator.

D [ ]) Both C1 and C2 are lag compensator.

E [ ]) HINTS-For a lead compensator, the zero is nearer to the origin and lag compensator the pole is nearer to the origin. Here in numerator (zero) s = - 1, denominator (pole) = - 10, So s = - 1 nearer to the origin. So C1 is lead compensator and C2 is lag compensator.

50) Time taken for the response to raise from zero to 100 % for very first time is called

A [v]) rise time.

B [ ]) settling time.

C [ ]) delay time.

D [ ]) peak time.

51) Time taken by the response to reach and stay within a specified error is called

A [ ]) raise time.

B [ ]) peak time.

C [v]) settling time.

D [ ]) peak over shoot.

52) An open loop, represented by the transfer function G (s) = (s - 1) / (s + 2)(s + 3), is

A [v]) stable and of the non-minimum phase type.

B [ ]) stable and of the minimum phase type.

D [ ]) unstable and of the non minimum phase type .

E [ ]) HINTS-Here one zero at s = 1, Two poles at s = - 2, s = - 3. Since zero lies in RHS of s - plane. It is nonminimum phase type, since both poles lie in LHS of s - plane, so the system is stable.

53) Lead network is used to improve

A [ ]) improve transient response.

B [ ]) increase bandwidth.

C [v]) both A and B.

D [ ]) improve steady state response.

54) Type and order of transfer function G (s) = K / {s(s + 2)}

A [v]) 1, 2.

B [ ]) 2, 1.

C [ ]) 0, 2.

D [ ]) 1, 1.

55) Name test signals used in time response analysis?

A [ ]) Unit step.

B [ ]) Unit ramp.

C [ ]) Impulse

D [v]) All of B, C, D.

56) A system is stable for

A [v]) GM and PM both +ve.

B [ ]) GM and PM both -ve.

C [ ]) GM -ve.

D [ ]) PM - ve.

57) In control system integrator is represented by

A [ ]) s.

B [ ]) S^2

C [ ]) $1/S^2$

D [v]) 1/S

E [ ]) HINTS- Intergrator is always represented by (1 /s) i.e 1 pole at the origin. Differentiator is represented by s i.e 1 zero at the origin.

58) For lead compensator pole lies

A [v]) on LHS before zero.

B [ ]) on origin.

C [ ]) on LHS.

D [ ]) on RHS.

59) The phase of lead compensator of the system G (s) = (s + a) / (s + b) is maximum at

A [ ]) ab.

B [v]) √(ab).

C [ ]) √(a / b).

D [ ]) a / b.

60) The second order system is defined by 25 / (s2 + 5s + 25) is given step input. The time taken for the output to settle with in 2 % of input is

A [v]) 1.65 sec.

B [ ]) 1.2 sec.

C [ ]) 2 sec.

D [ ]) 0.4 sec.

E [ ]) HINTS-Ts=4/0.5*5=1.65

61) The characteristic equation of a feedback control is 2s4 + s3 + 3s2 + 5s + 10 = 0. The no of roots in the right half of the s-plane is

A [v]) 2

B [ ]) 3

C [ ]) 4

D [ ]) 0

E [ ]) HINTS- There are two sign change in in right half of the s-plane.

62) A function of one or more variable which conveys information one to nature of physical phenomenon is called

A [v]) signal.

B [ ]) interference.

C [ ]) system.

D [ ]) noise.

63) None of the poles of a linear control system lie in the right half of s plane. For a bounded input, the output of this system

A [ ]) always bounded.

B [v]) could be unbounded.

C [ ]) tends to zero.

D [ ]) none of these.

64) Number of sign changes in the entries in 1st column of Routh array denotes the no. of

A [v]) roots of characteristic polynomial in RHP.

B [ ]) zeroes of system in RHP.

C [ ]) open loop poles in RHP.

D [ ]) open loop zeroes in RHP.

65) A cascade of three linear time invariant systems is causal and unstable. From this we conclude that

A [ ]) each system in the cascade is individually caused and unstable.

B [v]) at least one system is unstable and at least one system is causal.

C [ ]) at least one system is causal and all systems are unstable.

D [ ]) the majority are unstable and the majority are causal.

66) In the integral control of the single area system frequency error is reduced to zero. Then

A [ ]) integrator output and speed changer position attain a constant value.

B [ ]) integrator o/p decreases but speed changer position moves up.

C [ ]) integrator o/p increases but speed changer position comes down.

D [v]) integrator o/p decreases and speed changer position comes down.

67) When the polynomial is Hurwitz,

A [ ]) function is not real.

B [v]) the roots of function have real parts which are to be zero/negative..

C [ ]) all zeroes lie in the right half of the s-plane.

D [ ]) none of this.

68) Time response for a second order system depends on the value of τ. If τ= 0 then the system is called as

A [v]) undamped system.

B [ ]) under damped system

C [ ]) critically damped system.

D [ ]) over damped system.

69) For a unity feedback control system open loop transfer function G (s) = 10 / s(s + 1) then velocity error constant is

A [v]) 10.

B [ ]) 50.

C [ ]) 0.

D [ ]) NONE

70) For a transfer function H (s) = P(s) / Q(s), where P (s) and Q (s) are polynomials in s. Then

A [ ]) the degree of P (s) is always greater than the degree of Q (s).

B [ ]) the degree of P (s) and Q (s) are same.

C [v]) degree of P (s) is independent of degree of Q (s).

D [ ]) maximum degree of P (s) and Q (s) differ at most by one.

71) Transfer function of the control system depends on

A [v]) system parameters alone.

B [ ]) nature of the input.

C [ ]) initial conditions of input and output.

D [ ]) nature of the output.

72) Error constants of a system are measure of

A [ ]) transient state response

B [ ]) steady state as well as transient state response.

C [ ]) relative stability.

D [v]) steady state response.

73) Slope of asymptote in Bode plot of 2nd order system is _____ per octave.

A [ ]) 18 dB.

B [v]) 12 dB.

C [ ]) 6 dB.

D [ ]) 3 dB.

E [ ]) HINTS-Basically, the slope of an asymptote in a Bode plot of any system are n X 20 dB per decade (or) n X 6 dB per octave (an octave is a change in frequency by a factor of 2). Here, n is the order of the system. Hence, for a second order system, there might be (2 X 6 = 12) dB per octave.

74) The system is initially critical damped. If the gain of the system is doubled, then it will exhibit

A [ ]) over damped characteristics

B [ ]) critical damped characteristics

C [v]) Under damped characteristics

D [ ]) undamped characteristics

E [ ]) HINTS-For critical damped system the value of damping factor (ξ) is unity. Generally $\xi \propto 1/\sqrt{k}$ Where, k = system gain Therefore, if the gain of the system is doubled, the value of damping factor will less than unity. System will exhibit under damped characteristics.

75) A proportional plus derivative controller

A [ ]) has high sensitivity

B [ ]) increases the stability of the system

C [ ]) improves the steady state accuracy

D [v]) both A and B

76) A proportional plus integral controller

A [ ]) has high sensitivity

B [ ]) increases the stability of the system

C [v]) it increases rise time

D [ ]) both A and B

77) Which of the following controller is also known as anticipatory controller?

A [ ]) proportional controller

B [ ]) integral controller

C [v]) derivative controller

D [ ]) both A and B

78) Which of the following controller has sluggish response?

A [ ]) proportional controller

B [v]) integral controller

C [ ]) derivative controller

D [ ]) both A and B

79) In which of the following controller band width is increased?

A [ ]) proportional plus integral controller

B [v]) proportional plus derivative controller

C [ ]) both A and B

D [ ]) nether A nor B

80) Transient state analysis depends on which of the following?

A [ ]) type of system

B [v]) order of system

C [ ]) both

D [ ]) none

81) Two identical first order systems have been cascaded non interactively. The unit step response of the systems will be

A [ ]) Over damped

B [ ]) under damped

C [v]) critical damped

D [ ]) un damped

82) Settling time for 5% tolerance band is ----------

A [v]) 3T

B [ ]) 4T

C [ ]) 5T

D [ ]) 2T

E [ ]) HINTS-Settling time is the time taken by the response of the system to reach and stay within the limits of the tolerance band. For 2% tolerance band, settling time = $4/(\xi^*\omega n) = 4T$ For 5% tolerance band, settling time = $3/(\xi^*\omega n) = 3T$

83) The optimum values of damping ration is ----------

A [ ]) 0.9 to 1.1

B [ ]) 0.3 to 5

C [v]) 0.3 to 0.7

D [ ]) 0 to 2

E [ ]) HINTS-Damping ratio ξ = Actual damping/ Critical damping Most of the control systems are designed for damping ratio 'ξ' value less than 1. Because the response can be analysed using more number of performance specifications. The optimum value of damping ratio is 0.3 to 0.7.

84) The angle condition is used for checking whether any point lies on root locus or not is.....

A [v]) ± (2q + 1) 180°

B [ ]) ± (2q) 180°

C [ ]) ± (2q + 1) 360°

D [ ]) ± (2q) 360°

85) The magnitude condition for root locus is .....

A [ ]) |G(s)H(s)| = 0

B [ ]) |G(s)H(s)| = 2

C [v]) |G(s)H(s)| = 1

D [ ]) |G(s)H(s)| = ∞

86) Let P = Number of open loop poles and Z = Number of open loop zeros and P>Z, find the number of branches terminating at ∞ ?

A [ ]) Z

B [v]) P - Z

C [ ]) P

D [ ]) any of the above

E [ ]) HINTS-The root locus is defined as the locus of closed loop poles obtained when system gain k is varied from 0 to ∞. The root locus is symmetrical bout real axis. Let P = Number of open loop poles and Z = Number of open loop zeros and P>Z. The number of branches of root locus = P The number of branches terminating at zeros = Z The number of branches terminating at infinity = P - Z

87) The characteristic equation of a control system is give by $s(s + 4)(s^2 + 2s + 1) + k(s + 1) = 0$ What are the angles of asymptotes for the root loci for $k \geq 0$?

A [ ]) 0°, 120°, 240°

B [ ]) 0°, 180°, 300°

C [v]) 60°, 180°, 300°

D [ ]) 120°, 180°, 240°

88) The characteristic equation of a control system is give by $s(s + 4)(s^2 + 2s + 1) + k(s + 1) =0$. Find the angle between the asymptotes?

A [ ]) 60°

B [ ]) 360°

C [v]) 120°

D [ ]) 180°

E [ ]) HINTS-Given characteristic equation $s(s + 4)(s^2 + 2s + 1) + k(s + 1) =0$ $1 + k(s + 1) / s(s + 4)(s^2 + 2s + 1) = 0$ Number of poles P = 4 Number of zeros Z = 1 P - Z = 3 Angle between the asymptotes = $2\pi/(P - Z) = 360°/3 = 120°$

89) Which of the following statements is/are true?

A [ ]) Centroid may be a part of root locus

B [ ]) Centroid may not be a part of root locus

C [v]) both A and B

D [ ]) nether A nor B

E [ ]) HINTS-Centroid is the intersection point of the asymptotes on the real axis. It may or may not be a part of the root locus. Centroid =(Σ(Real part of open loop poles) - Σ(Real part of open loop zeros))/(P - Z)

90) A control system has open loop transfer function G(s) = k/(s(s + 2). Find the break away point?

A [v]) -1

B [ ]) 1

C [ ]) -2

D [ ]) 2

E [ ]) HINTS-The roots of dk/ds = 0 will give the break away points. Given characteristic equation is $s^2 + 2s +k =0$ $k = -s^2 -2s$ $dk/ds = -2s -2 =0$ Break away point s = -1

91) Angle condition for complimentary root locus or inverse root locus is

A [ ]) ± (2q + 1) 180°

B [v]) ± (2q) 180°

C [ ]) ± (2q + 1) 360°

D [ ]) ± (2q) 360°

E [ ]) HINTS-The angle condition is used for checking whether any point lies on root locus or not and also validity of the root locus shape. 1 + G(s)H(s) = 0 Angle condition for root locus = ± (2q + 1) 180° Angle condition for complimentary root locus = ± (2q) 180°

92) Angle of asymptotes for complimentary root locus is

A [ ]) (2q+1)*180/(P-Z)

B [ ]) (2q+1)*180/P

C [v]) (2q)*180/(P-Z)

D [ ]) (2q)*180/P

E [ ]) HINTS-Shape of root locus will depends on angle of asymptotes. The "P - Z" branches will terminate at infinity along certain straight lines known as asymptotes of root locus. Angle of asymptotes for root locus = (2q+1)*180/(P-Z) Angle of asymptotes for complimentary root locus = (2q)*180/(P-Z)

93) The open loop transfer function of a unity feedback system is given by $G(s) = 1/(s+2)^2$. The closed loop transfer function will have poles at

A [ ]) -2,-2

B [ ]) -2,-1

C [v]) -2+j,-2-j

D [ ]) -2,2

E [ ]) HINTS-Open loop transfer function $G(s) = 1/(s+2)^2$ For unity feedback system $H(s) = 1$ Therefore, closed loop transfer function = $G(s)/(1 + G(s)H(s)) = 1/(s^2 + 4s + 5)$ Therefore, closed loop poles will be the roots of $s^2 + 4s + 5 = 0$ i.e. $s = -2+j, -2-j$

94) When deriving the transfer function of linear element

A [ ]) both initial conditions and loading are taken into account

B [ ]) initial conditions are taken into account but the element is assumed to be not loaded

C [v]) initial conditions are assumed to be zero but loading is taken into account

D [ ]) initial conditions are assumed to be zero and the element is assumed to be not loaded

95) Given the Laplace transform of f(t) = F(s), the Laplace transform of (f(t)e-at) is equal to

A [ ]) F(s)/(s+a)

B [v]) F(s+a)

C [ ]) e-as*F(s)

D [ ]) eas*F(s)

96) The transfer function of the system described by $d^2/dt^2(y(t)) + 3d/dt(y(t)) + 2y(t) = 5u(t)$ with u(t) as input and y(t) as output is

A [v]) $5/(s^2+3s+2)$

B [ ]) $5/s(s^2+3s+2)$

C [ ]) $(s^2+3s+2)/5$

D [ ]) $s(s^2+3s+2)/5$

E [ ]) HINTS-Given that $d^2/dt^2(y(t)) + 3d/dt(y(t)) + 2y(t) = 5u(t)$ By taking Laplace transforms, $(s^2+3s+2)Y(s) = 5\ U(s)$ Transfer function = $5/(s^2+3s+2)$

97) The characteristic equation has the following roots for over damped stable system?

A [ ]) -2,-2

B [ ]) -2±j4

C [ ]) -2,-4

D [v]) -2,2

E [ ]) HINTS-1. For over damped system, the roots are real and unequal. 2. For under damped system, the roots are complex and conjugate. 3. For critically damped system, the roots are real and equal. 4. For un damped system, the roots are imaginary.

98) In frequency response analysis of second order system, the error at corner frequency is

A [ ]) 20 log2ξ

B [ ]) 10 logξ

C [v]) -20 log2ξ

D [ ]) -10 logξ

99) Which of the following represents the value of resonant frequency (ωr)?

A [ ]) (ωn) $\sqrt{(1-\zeta^2)}$

B [v]) (ωn) $\sqrt{(1-2\zeta^2)}$

C [ ]) 2*(ωn) $\sqrt{(1-\zeta^2)}$

D [ ]) (ωn) $\sqrt{(1-\zeta^2/2)}$

100) Find the relation of damped natural frequency (ωd)

A [ ]) (ωn) $\sqrt{(1-2\zeta^2)}$

B [ ]) (ωn) $\sqrt{(1-4\zeta^2)}$

C [ ]) (ωn) $\sqrt{(1-1/\zeta^2)}$

D [v]) (ωn) $\sqrt{(1-\zeta^2)}$

101) Find the bandwidth of the system, when rise time of the system is give as 1msec?

A [ ]) 1 kHz

B [ ]) 500 Hz

C [v]) 350 Hz

D [ ]) 750 Hz

E [ ]) HINTS-Bandwidth = 0.35/Rise time = 0.35/(1*10-3) = 350 Hz

102) If the bandwidth of the system is very large, the system response is

A [v]) faster

B [ ]) slower

C [ ]) independent of bandwidth

D [ ]) none of the above

103) The magnitude of a transfer function G(jω)H(jω) at gain cross over frequency is

A [ ]) 0

B [v]) 1

C [ ]) infinity

D [ ]) any of the above

E [ ]) HINTS-Stability from frequency response plots $1 + G(s)H(s) = 0$ $G(s)H(s) = -1 + j0$ Put $s = j\omega$ $G(j\omega)H(j\omega) = -1 + j0$ $|G(j\omega)H(j\omega)|$ at gain cross over frequency = 1 $\angle G(j\omega)H(j\omega)$ at phase cross over frequency = -180°

104) A second order under damped system has damping ratio of 0.3. Find the phase margin of the system?

A [ ]) 20°

B [ ]) 3°

C [v]) 30°

D [ ]) 60°

E [ ]) HINTS-Phase margin is the allowable phase lag. $\angle G(j\omega)H(j\omega)$ at gain cross over frequency = φ Phase margin = 180° + φ And also Phase margin ≈ 100*ξ Therefore, for given system Phase margin = 30°

105) If the magnitude of G(jω)H(jω) at phase crossover frequency is 0.5. Find the gain margin of the given system?

A [ ]) 0.5

B [v]) 2

C [ ]) 1

D [ ]) 4

E [ ]) HINTS-Gain margin is the allowable gain. $|G(j\omega)H(j\omega)|$ at phase crossover frequency = X Gain margin = 1/X Gain margin in db = 20 log(1/X) For given system gain margin = 1/0.5 = 2

106) Which of the following is the correct expression for the transfer function of an electrical RC phase lag compensating network?

A [ ]) RCS/(1+RCS)

B [ ]) RC/(1+RCS)

C [ ]) C/(1+RCS)

D [v]) 1/(1+RCS)

107) In polar plots if the critical point '-1+j0' is enclosed then the system is --------

A [ ]) stable

B [v]) unstable

C [ ]) marginally stable

D [ ]) critical stable

E [ ]) HINTS-A point is said to be enclosed by a contour if it lies to the right side of the direction of the contour. A point is said to be encircled if the contour is a closed path. In polar plots if the critical point '-1+j0' is enclosed then the system is said to be unstable and if it not enclosed then the system is said to be stable.

108) Resonant peak of a marginally stable system is

A [ ]) 0

B [ ]) finite value

C [v]) infinite

D [ ]) any of the above

E [ ]) HINTS-Resonant peak is the maximum value of magnitude occurring at resonant frequency ωr. Resonant peak μr = $1/(2\zeta\sqrt{(1-\zeta^2)})$ For marginally stable system, damping ratio ζ = 0 Therefore, resonant peak = Infinity

109) What is the effect of gain margin when the system gain is doubled?

A [ ]) 2 times

B [v]) 1/2 times

C [ ]) remains unaffected

D [ ]) none of the above

E [ ]) HINTS-Gain margin is the allowable gain. $|G(j\omega)H(j\omega)|$ at phase crossover frequency = X Gain margin = 1/X Gain margin in db = 20 log(1/X) Gain margin $\propto$ 1/k Where k = System gain therefore, if the system gain is doubled, gain margin is half i.e 1/2 times.

110) Find the corner frequency for the following transfer function? G(s) = 1/(s+2)

A [v]) 2 rad/s

B [ ]) 1/2 rad/s

C [ ]) 4 rad/s

D [ ]) 1/4 rad/s

E [ ]) HINTS-Corner frequency for first order function ωcf = 1/T Given function G(s) = 1/(s+2) G (s) = 1/2(1+s/2) G(s) = 1/(1+Ts) Therefore, T = 1/2 Corner frequency ωcf = 2 rad/s

111) Error at corner frequency ωcf of first order system is -------

A [ ]) ±1 db

B [ ]) ±2 db

C [v]) ±3 db

D [ ]) ±4 db

E [ ]) HINTS-Magnitude for first order factor is $|F(j\omega)| = \pm 20 \log \sqrt{(1+(\omega T)^2)}$ At corner frequency $\omega = \omega cf = 1/T$ $|F(j\omega)| = \pm 20 \log \sqrt{2}$ $|F(j\omega)| = \pm 3db$

112) The maximum phase lag occurs at the ---------- of the two corner frequencies?

A [ ]) arithmetic mean

B [v]) geometric mean

C [ ]) either A or B

D [ ]) none of the above

113) If the transfer function of a phase lead compensator is (s+a)/(s+b) and that of a lag compensator is (s+p)/(s+q), then which one of the following sets of conditions must be satisfied?

A [ ]) a > b, p > q

B [ ]) a > b, p < q

C [ ]) a < b, p < q

D [v]) a < b, p >q

E [ ]) HINTS-The transfer function of phase lead compensator = $\alpha(1 + TS)/(1 + \alpha TS)$ Where $\alpha < 1$ Therefore for lead compensator zero is nearer to origin. The transfer function of phase lag compensator = $(1 + TS)/(1 + \beta TS)$ Where $\beta > 1$ Therefore for lag compensator pole is nearer to origin. Therefore, a < b, p >q

114) The compensator G(s) = 5(1 + 0.3s)/(1 + 0.1s) would provide a maximum phase shift of

A [ ]) 20°

B [ ]) 45°

C [v]) 30°

D [ ]) 60°

E [ ]) HINTS-Given transfer function G(s) = 5(1 + 0.3s)/(1 + 0.1s) The transfer function of phase lead compensator = $\alpha(1 + TS)/(1 + \alpha TS)$ By comparison, T = 0.3 $\alpha = 1/3$ Maximum phase shift $\varphi m = \sin^{-1}((1 - \alpha)/(1 + \alpha))$ $\varphi m = \sin^{-1}((1-1/3)/(1+1/3))$ $\varphi m = 30°$

115) With regard to filtering property, the lead compensator is

A [ ]) low pass filter

B [ ]) band pass filter

C [v]) high pass filter

D [ ]) band reject filter

116) A controller transfer function is given by C(s) = (1+2s)/(1+0.2s). What is its nature and parameter?

A [ ]) lag compensator, β = 10

B [ ]) lag compensator, β = 2

C [ ]) lead compensator, α = 0.2

D [v]) lead compensator, α = 0.1

E [ ]) HINTS-The transfer function of phase lead compensator = α(1 + TS)/(1 + αTS) Where α < 1 Therefore for lead compensator zero is nearer to origin. Given transfer function = (1+2s)/(1+0.2s) By comparing two transfer functions, T = 2 and α = 0.1 Therefore, given transfer function is lead compensator.

117) Which of the following is/are represents the lead compensator?

A [ ]) (s+2)/(s+1)

B [ ]) (s+2)/(s+5)

C [ ]) (s+5)/(s+6)

D [v]) both B and C

118) To achieve the optimum transient response, the indicating instruments are so designed as to

A [ ]) be undamped.

B [ ]) be critically damped.

C [v]) provide damping which is slightly less than the critical value.

D [ ]) provide damping which is slightly more than the critical value.