Comprehension Questions - Control Systems

1. A causal system is always
a) anticipative
b) linear
c) non-anticipative
d) nonlinear

2. Consider a washing machine unit to which an electric current is provided as input and the rotational speed of the drum is the output. Then, if one wants to find a mathematical relationship between the electric current input and the drum rotational speed output, then one is solving the problem of
a) synthesis
b) prediction
c) control
d) estimation

3. Which one of the following is an example of open loop control?
a) Air conditioner
b) Servo motor
c) Water tank level control
d) Ceiling fan

4. In a typical closed loop system layout, the element that takes the controller output and realizes the same to provide it as the system input is called as the
a) Plant
b) Controller
c) Actuator
d) Sensor

5. Feedback can cause a system that is originally stable to become_____
a) Stable
b) Unstable
c) Conditionally stable
d) Either more stable or unstable

6. The effect of adding feedback makes the system_____
a) Linear
b) Non-linear
c) Time variant
d) Time invariant

7. The relation between output response and input signal in closed loop system is
a) Exponential
b) Parabolic
c) Linear
d) Nonlinear

8. Regenerative feedback is also called as_____
a) Negative feedback
b) Positive feedback
c) No feedback
d) Negative and Positive Feedback

9. Which of the following are the characteristics of regenerative feedback:
a) Zero damping
b) Stable
c) Least sensitive to parameter variations
d) None of the mentioned

10. Which of the following are true:
a) Sensitivity of regenerative feedback is more than negative feedback but less than non-feedback system
b) Sensitivity of regenerative feedback is more non-feedback system but less than negative feedback system
c) Sensitivity of regenerative feedback is less than both
d) Sensitivity of regenerative feedback is more than both

11. In an automatic control system which of the following elements is not used?
a) Error detector
b) Final control element
c) Sensor
d) Oscillator

12. In a control system the output of the controller is given to
a) Final control element
b) Amplifier
c) Comparator
d) Sensor

13. A controller, essentially, is a
a) Sensor
b) Clipper
c) Comparator
d) Amplifier

14. Which of the following is the input to a controller?
a) Servo signal
b) Desired variable value
c) Error signal
d) Sensed signal

15. The on-off controller is a _____ system
a) Digital
b) Linear
c) Non-linear
d) Discontinuous

16. The capacitance, in force-current analogy, is analogous to
a) Momentum
b) Velocity
c) Displacement
d) Mass

17. The temperature, under thermal and electrical system analogy, is considered
a) Voltage
b) Current
c) Capacitance
d) Charge

18. In electrical-pneumatic system analogy the current is considered analogous to
a) Velocity
b) Pressure
c) Air flow
d) Air flow rate

19. The use of feedback element in the feedback loop is:
a) It converts the output variable ‘c’ to another suitable feedback variable ‘b’ to compare with the input command signal
b) It is the actuating element
c) To increase the stability
d) None of the mentioned

20. The major components of a controller are
a) Control element
b) Error detector and control element
c) Feedback element
d) Error detector and feedback element

21. Which of the following is not the feature of modern control system?
a) Quick response
b) Accuracy
c) Correct power level
d) No oscillation

22. The output of the feedback control system must be a function of:
a) Reference input
b) Reference output
c) Output and feedback signal
d) Input and feedback signal

23. In regenerating the feedback, the transfer function is given by
a) C(s)/R(s)=G(s)/1+G(s)H(s)
b) C(s)/R(s)=G(s)H(s)/1-G(s)H(s)
c) C(s)/R(s)=G(s)/1+G(s)H(s)
d) C(s)/R(s)=G(s)/1-G(s)H(s)

24. A transfer function has two zeroes at infinity. Then the relation between the numerator(N) and the denominator degree(M) of the transfer function is:
a) N=M+2
b) N=M-2
c) N=M+1
d) N=M-1

25. When deriving the transfer function of a 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) 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

26. Lead compensation leads to:
a) Increases bandwidth
b) Attenuation
c) Increases damping factor
d) Second order

27. The class of linear time varying causal SISO dynamic systems is typically characterized by
a) linear ODEs with constant coefficients
b) nonlinear ODEs with constant coefficients
c) linear ODEs with time varying coefficients
d) nonlinear ODEs with time varying coefficients

28. Rate compensation :
a) Increases bandwidth
b) Attenuation
c) Increases damping factor
d) Second order

29. Which of the following may result in instability problem?
a) Large error
b) High selectivity
c) High gain
d) Noise

30. Routh Hurwitz criterion cannot be applied when the characteristic equation of the system containing coefficient's which is/are
a) Exponential function of s
b) Sinusoidal function of s
c) Complex
d) Exponential and sinusoidal function of s and complex

31. Which of the test signals are best utilized by the stability analysis
a) Impulse
b) Step
c) Ramp
d) Parabolic

32. For making an unstable system stable:
a) Gain of the system should be increased
b) Gain of the system should be decreased
c) The number of zeroes to the loop transfer function should be increased
d) The number of poles to the loop transfer function should be increased

33. OLTF contains one zero in right half of s-plane then
a) Open loop system is unstable
b) Close loop system is unstable
c) Close loop system is unstable for higher gain
d) Close loop system is stable

34. The critical value of gain for a system is 40 and gain margin is 6dB. The system is operating at a gain of:
a) 20
b) 40
c) 80
d) 120

35. The roots of the characteristic equation of the second order system in which real and imaginary part represents the :
a) Damped frequency and damping
b) Natural frequency and damping ratio
c) Damping ratio and damped frequency
d) Damping ratio and natural frequency

36. The polar plot of a transfer function passes through the critical point (-1,0). Gain margin is
a) Zero
b) -1dB
c) 1dB
d) Infinity

37. If the gain of the open-loop system is doubled, the gain margin
a) Is not affected
b) Gets doubled
c) Becomes half
d) Becomes one-fourth

38. For the transfer function
G(s) H(s) = 1 / s(s+1) (s+0.5), the phase cross-over frequency is
a) 0.5 rad/sec
b) 0.707 rad/sec
c) 1.732 rad/sec
d) 2 rad/sec

39. . Consider the following statements:
The gain margin and phase margin of an unstable system may respectively be
1. Positive, positive
2. Positive, negative
3. Negative, positive
4. Negative, negative
Of these statements,
a) 1 and 4 are correct
b) 1 and 2 are correct
c) 1, 2 and 3 are correct
d) 2,3 and 4 are correct

40. For a stable closed loop system, the gain at phase crossover frequency should always be:
a) < 20 dB
b) < 6 dB
c) > 6 dB
d) > 0 dB

41. Which one of the following methods can determine the closed loop system resonance frequency operation?
a) Root locus method
b) Nyquist method
c) Bode plot
d) M and N circle

42. The critical value of gain for the system is 40. The system is operating at a gain of 20. The gain margin of the system is :
a) 2 dB
b) 3 dB
c) 6 dB
d) 4 dB

43. The phase angle of the system G(s) =s+5/s2+4s+9;varies between
a) 0° and 90°
b) 0° and -90°
c) 0° and -180°
d) -90° and -180°

44. The main objective of drawing root locus plot is
a) To obtain a clear picture about the open loop poles and zeroes of the system
b) To obtain a clear picture about the transient response of feedback system for various values of open loop gain K
c) To determine sufficient condition for the value of 'K' that will make the feedback system unstable
d) To obtain a clear picture about the transient response of feedback system for various values of open loop gain K and To determine sufficient condition for the value of 'K' that will make the feedback system unstable

45. The addition of open loop poles pulls the root locus towards:
a) The right and system becomes stable
b) Imaginary axis and system becomes marginally stable
c) The left and system becomes unstable
d) The right and system becomes unstable

46. Root locus is used to calculate:
a) Marginal stability
b) Absolute stability
c) Conditional stability
d) Relative stability

47. Number of roots of characteristic equation is equal to the number of _____
a) Branches
b) Root
c) Stem
d) Poles
48. What is the number of the root locus segments which do not terminate on zeroes?
a) The number of poles
b) The number of zeroes
c) The difference between the number of poles and zeroes
d) The sum of the number of poles and the number of the zeroes

49. Which one of the following are correct?
The root locus is the path of the roots of the characteristic equation traced out in the s-plane?
a) As the input of the system is changed
b) As the output of the system is changed
c) As a system parameter is changed
d) As the sensitivity is changed

50. If the gain of the system is reduced to a zero value, the roots of the system in the s-plane,
a) Coincide with zero
b) Move away from zero
c) Move away from poles
d) Coincide with the poles

----------Answer Key----------

1. (c)
2. (a)
3. (d)
4. (c)
5. (d)
6. (a)
7. (c)
8. (b)
9. (a)
10. (c)
11. (a)
12. (a)
13. (c)
14. (c)
15. (d)
16. (d)
17. (a)
18. (d)
19. (a)
20. (b)
21. (d)
22. (d)
23. (d)
24. (b)
25. (c)
26. (a)
27. (c)
28. (c)
29. (c)
30. (d)
31. (a)
32. (b)
33. (c)
34. (a)
35. (c)
36. (a)
37. (a)
38. (b)
39. (d)
40. (d)
41. (d)
42. (c)
43. (c)
44. (d)

45. (d)
46. (d)
47. (a)
48. (c)
49. (c)
50. (d)