Course: B.Tech **Academic Year: 2019-20**

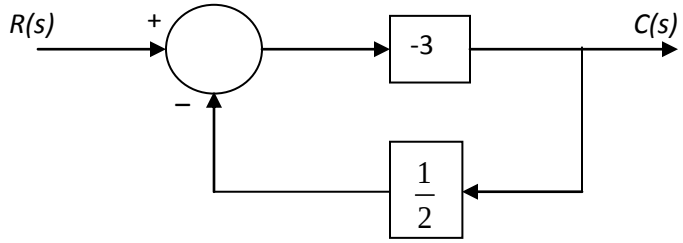
Name of the Subject: Control Systems Engineering (15A02303) **Class/Sec: II-I**

Name of the Staff:.K.N.Y.SAI MADHURI /Y.HARI KRISHNA

MULTIPLE CHOICE QUESTIONS

UNIT – I

1. The closed loop gain of the system shown in Fig. is [b]



a) –9/5 b) 6 c) 6/5 d) 9/5

2. which of the following is example of open loop control system [a]
   a) Time based Traffic light controller b) DC motor speed control
   c) Human being d) Temperature control system
3. which of the following is example of closed loop control system [c]
   a) Traffic light controller b) Sprinkler used to water a lawn
   c) DC motor speed control along with sensor d) Stepper motor positioning system
4. Choose the natural control system from the following [c]
   a) Traffic light controller b) Sprinkler used to water a lawn
   c) Inside Human being d) Stepper motor positioning system

5. In Force- voltage analogy spring constant is analogous to [d]
   A) Capacitance B) Current
   C) Reciprocal of inductance D) Reciprocal of Capacitance

6.. Feedback control systems are [a]
   a) In sensitive to both forward and feedback-path parameter changes.

b) Less sensitive to forward path parameter changes than feedback-path parameter changes.

c) Less sensitive to feedback path parameter changes than to forward-path parameter changes

d) Equally sensitive to both forward and feedback path parameter changes.

7. Transfer function of a system is defined as [b]

a) ratio of Laplace transform of input variable to the Laplace transform of the output variable when all initial conditions are zero

b) ratio of Laplace transform of output variable to the Laplace transform of the input variable when all initial conditions are zero

c) Laplace transform of the output variable when all initial conditions are zero

d) Laplace transform of the input variable when all initial conditions are zero

8. Knowledge of the transfer function is necessary for the calculation of [b]

a) time constant b) output for a given input c) order of a system d) none of these

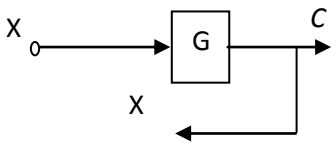
9. Which of the following is not a translational element? [c]

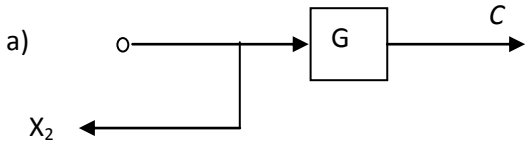
a) Mass b) Dash Pot c) Inertia D) Spring Constant

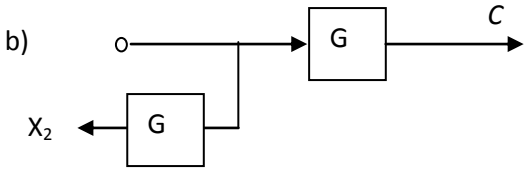
10. Impulse response of transfer function is [a]

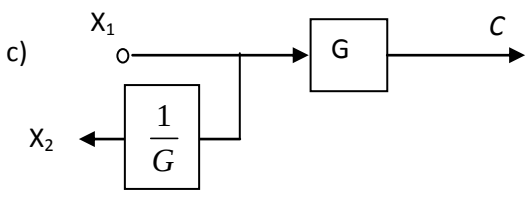
a) Output Response b) input Response c)Step response d)None

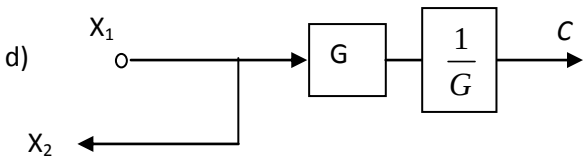
11.The block diagram shown in Fig. is equivalent to [B]











12) In Force- voltage analogy dash pot is analogous to [a]

A) Resistance B) Current

C) Reciprocal of inductance D) Reciprocal of Capacitance

13. In torque - voltage analogy dash pot is analogous to [a]

A) Resistance B) Current

C) Reciprocal of inductance D) Reciprocal of Capacitance

14 The sensitivity of a closed-loop system to gain changes and load disturbances depends upon

a) loop gain b) forward gain, loop gain and frequency [b]

c) forward gain d) frequency

15. The blocks with the gains 4, 6 and 8 are connected in parallel. The total gain of the arrangement is… [a]

a)18 b)196 c)32 d)52

16. In a signal flow graph, a forward path is a [c]

a) closed path that originates at one node and terminates on a different node

b) closed path that originates at input node and terminates at the output node

c) path from input node to output node so that no node is crossed more than once.

d) closed path forming the feedback loop

17. Signal flow graph is used to represents [a]

a)only linear systems b)only non linear systems

c)both l\inear and nonlinear system d)none

18. Any physical system which does not automatically correct for variation in its output is called [a]

(a) Open loop (b) closed loop (c) unstable (d) stable

19. Synchro is a/an [c]

(a) Frequency transmitter (b) Electronic rectifier

(c) Electromagnetic transducer (d) Electro mechanical device

20. The principle of homogeneity and Superposition theorem is applied to [a]

(a) Linear Time Invariant System (b) Non Linear Time variant system

(c) Linear Time variant system (d) Non Linear Time Invariant system

21. The blocks with the gains 6, 6 and 8 are connected in parallel. The total gain of the arrangement is… [c]

a)18 b)196 c)20 d)52

22. The blocks with the gains 2 and 4 are connected in series. The total gain of the arrangement is… [a]

a)8 b)16 c)12 d)42

23. In an open loop control system [a]

(a) Output is independent of control input

(b) Output is dependent on control input

(c) Only system parameters have effect on the control output

(d) None of the above

23. In Force- Current analogy spring constant is analogous to [c]

A) Capacitance B) Current

C) Reciprocal of inductance D) Reciprocal of Capacitance

24. A control system in which the control action is somehow dependent on the output is known as [a]

(a) Closed loop system

(b) Semiclosed loop system

(c) Open system

(d) None of the above

25. In closed loop control system, with positive value of feedback gain the overall gain of the system will [a]

(a) decrease

(b) increase

(c) be unaffected

(d) any of the above

26. In Force- Current analogy Mass constant is analogous to [a]

A) Capacitance B) Resistance

C) Reciprocal of Resistance D) Reciprocal of Capacitance

27. In Force-Voltage analogy Mass constant is analogous to [b]

A) Capacitance B) Inductance

C) Reciprocal of inductance D) Reciprocal of Capacitance

28. Which of the following is an open loop control system ? [a]

(a) Field controlled D.C. motor

(b) Ward leonard control

(c) Metadyne

(d) Stroboscope

29. Which of the following statements is not necessarily correct for open control system ? [b]

(a) Input command is the sole factor responsible for providing the control action

(b) Presence of non-linearities causes malfunctioning

(c) Less expensive

(d) Generally free from problems of non-linearities

30. In open loop system [d]

(a) the control action depends on the size of the system

(b) the control action depends on system variables

(c) the control action depends on the input signal

(d) the control action is independent of the output

31 . ___has tendency to oscillate. [b]

(a) Open loop system

(b) Closed loop system

(c) Both (a) and (b)

(d) Neither (a) nor (b)

32. In Force- Current analogy dashpot constant is analogous to [b]

A) Capacitance B) Reciprocal of Resistance

C) Reciprocal of inductance D) Reciprocal of Capacitance

33. A closed loop system is distinguished from open loop system by which of the following ?

(a) Servomechanism [b]

(b) Feedback

(c) Output pattern

(d) Input pattern

34. ___ is a part of the human temperature control system. [b]

(a) Digestive system

(b) Perspiration system

(c) Ear

(d) Leg movement

35. In Torque- Current analogy spring constant is analogous to [c]

A) Capacitance B) Current

C) Reciprocal of inductance D) Reciprocal of Capacitance

36. An automatic toaster is a _____ loop control system. [a]

(a) open

(b) closed

(c) partially closed

(d) any of the above

37. In Torque - Current analogy dashpot constant is analogous to [b]

A) Capacitance B) Reciprocal of Resistance

C) Reciprocal of inductance D) Reciprocal of Capacitance

38. A good control system has all the following features except [b]

(a) good stability

(b) slow response

(c) good accuracy

(d) sufficient power handling capacity

39. A car is moving at a constant speed of 50 km/h, which of the following is the feedback element for the driver ? [c]

(a) Clutch

(b) Eyes

(c) Needle of the speedometer

(d) Steering wheel

40. In Torque- Voltage analogy spring constant is analogous to [d]

A) Capacitance B) Current

C) Reciprocal of inductance D) Reciprocal of Capacitance

UNIT – II TIME RESPONSE ANALYSIS

1 The closed loop transfer function of a second order system is given by $\frac{200}{S^2+20S+200}$. Determine the damping ratio. [c]

a) 0.7 b) 0.75 c) 0.707 d) 7

2. The steady state error of a control system can be reduced by increasing its [d]

a) gain constant b) time constant

c) both gain constant & time constant d) gain constant, time constant and damping frequency

3. A unit ramp function on integration results in [b]

a) Unit doublet b) Unit parabolic function

c) Unit step function d) Unit impulse function

4. The overshoot is an indication of [c]

a) No error b/w the actual and desired output

b) Least error b/w actual and desired output

c) Largest error b/w the actual and desired output d) Response b/w output and input

5. Rise time of the second order system for under damped case is determined by [d]

a) * b) $\frac{\pi}{wd-\theta}$ c) $\frac{\theta}{\pi+wd}$ d) $\frac{\pi-\theta}{wd}$

. 6. The overshoot present in a system depends on [a]

a) ξ b) ω_n c) both ξ and ω_n d) doesn't depend on ξ or ω_n

7. With feedback system [c]

a) the transient response gets magnified

b) the transient response decays at a constant rate

c) the transient response decays more quickly

d) the transient response decays slowly

8. The characteristic equation for the second order differential equation of the form

$$\frac{d^2y}{dt^2} + 2\xi\omega_n \frac{dy}{dt} + \omega_n^2 y = \omega_n^2 x$$ [a]

a) $S^2 + 2\xi\omega_n S + \omega_n^2 = 0$ b) small overshoot

c) no overshoot d) large undershoot

9. A second order system has a damping ratio of 0.6 and natural frequency of oscillation is 10rad/sec. Determine the damping frequency of oscillations [c]

a) 5rad/sec b) 6rad/sec c) 8rad/sec d) 10rad/sec

10. The characteristic equation of the second order system is given by $S^2 + 2\xi\omega_n S + \omega_n^2 = 0$ if $\xi = 0$ then the system response will be [d]

a) damped oscillations b) zero

c) critically damped oscillatory d) constant amplitude sinusoidal

11. The damped natural frequency of an under damped second order system is given by [c]

a) $\omega_d^2 = \omega_n$ b) $\omega_d = \omega_n$ c) $\omega_d = \omega_n \sqrt{(1-\xi^2)}$ d) $\omega_n = \omega_d \sqrt{(1-\xi^2)}$

12. The type-1 system has…….at the origin. [b]

a) simple zero b) one pole c) two poles d) two zeroes

13.The output response of a first order system for a unit step input is _____ [c]

a) $c(t)=1+e^{-t/T}$ b) $c(t)= 1 - e^{t/T}$ c) $c(t)= 1- e^{-t/T}$ d) $c(t)= 1+e^{-t}$

14. The order of the system is determined by the [c]

a) The number of poles at the origin

b) The number of stable roots of the system

c) Power of S in the denominator of the transfer function

d) Number of multiplying terms in the denominator

15 . The ratio of the damped frequency to natural frequency of the given system having a damping factor ξ is [d]

a) $\frac{1}{\zeta}$ b) ζ^2 c) $\sqrt{1+\zeta^2}$ d) $\sqrt{1-\zeta^2}$

16. The open loop transfer function of a unity feedback control system is $G(s)=1/(s+2)^2$. The closed loop transfer function will have poles at [c]

A) –2,-2 B)–2,-1 C) 2±j D) –2, +2

17. Rise time indicates the time required for the response to rise from _____ of the final value. [c]

a)10 % -50% b) 50%-100% c) 0%-1000% d) 25%-50%

18. Steady state error of a system depends on [d]

a) Order of a system and input signal

b) Order and Type number of system

c) Type number of a system and Input signal

d) Order, Type number and input signal of system

19. The roots of the under damped system are [b]

a) Purely imaginary b) complex conjugate c) real d) none

20. Laplace of IR is known as [a]

a) T.F B) damping c) step response d) none

21 .___ increases the steady state accuracy. [a]

(a) Integrator
(b) Differentiator
(c) Phase lead compensator
(d) Phase lag compensator

22. The transient response, with feedback system, [d]

(a) rises slowly
(b) rises quickly
(c) decays slowly
(d) decays quickly

23. Due to which of the following reasons excessive bond width in control systems should be avoided ? [c]

(a) It leads to slow speed of response
(b) It leads to low relative stability
(c) Noise is proportional to band width
(d) None of the above

24.The transient response of a system is mainly due to [c]

(a) inertia forces
(b) internal forces
(c) stored energy
(d) friction

25.Static error co-efficients are used as a measure of the effectiveness of closed loop systems for specified _____ input signal. [d]

(a) acceleration
(b) velocity
(c) position
(d) all of the above

26.The position and velocity errors of a type-2 system are [c]

(a) constant, constant
(b) constant, infinity
(c) zero, constant
(d) zero, zero

27. The type 1 system has _____ at the origin. [c]

(a) no pole
(b) net pole
(c) simple pole
(d) two poles

28. The type 2 system has at the origin. [d]

(a) no net pole

(b) net pole

(c) simple pole

(d) two poles

29.Velocity error constant of a system is measured when the input to the system is unit _____ function. [b]

(a) parabolic

(b) ramp

(c) impulse

(d) step

30.In case of type-1 system steady state acceleration is [b]

(a) unity

(b) infinity

(c) zero

(d) 10

31. If a step function is applied to the input of a system and the output remains below a certain level for all the time, the system is [a]

(a) not necessarily stable

(b) stable

(c) unstable

(d) always unstable

(e) any of the above

32.If the gain of the critical damped system is increased it will behave as [d]

(a) oscillatory

(b) critically damped

(c) overdamped

(d) underdamped

33. In a control system integral error compensation _____ steady state error

(a) increases [b]

(b) minimizes

(c) does not have any effect on

(d) any of the above

34. With feed back _____ reduces. [b]

(a) system stability

(6) system gain

(c) system stability and gain

(d) none of the above

35. The first order control system, which is well designed, has a [c]

(a) small bandwidth

(b) negative time constant

(c) large negative transfer function pole

(d) none of the above

36. Steady state error is always zero in response to the displacement input for

a) Type 0 system [d]

b) Type 1 system

c) Type 2 system

d) Type (N > 1) system for N= 0, 1, 2….N

37. For second order linear system, setting time is [c]

a) 1/4 of the time constant

b) 1/2 of the time constant

c) 4 times the time constant

d) 2 times the time constant

38. System generally preferred is [a]

a) Under damped

b) Critically damped

c) Over damped

d) Oscillatory

39. For unity damping factor, the system will be [b]

a) Under damped

b) Critically damped

c) Over damped

d) Oscillatory

40.. If for second order system damping factor is less than one, then system response will be

a) Under damped [a]

b) Over damped

c) Critically damped

d) None of these

UNIT III STABILITY

1. The location of the closed loop conjugate pair of pole on JW axis indicates that the system is [d]

a) Stable b) Unstable c) Critically stable d) Marginally stable

2. With reference to following characteristic equation of a feed back control system, the centroid of the root locus plot $S^3 + 2S^2 + KS + K = 0$ [b]

a) 0.5 b) - 0.5 c) - 1 d) 1

3. The angle of asymptotes w.r.t. root locus plot for a control system having

$G(s)H(s) = S^2 + 1 / S(S + 1)$ are [b]

a) $\pm 90^0$ b) Nil c_ $\pm 270^0$ d) $\pm 180^0$

4. The root locus separates at a point between two open loop poles, the point is called [d]

a) Critical point b) Cross over point c) Shift point d) Break away point

5. If the root locus lies only on the negative real axis then the response is [a]

a) Over damped b) Under damped c) Oscillatory d) Sustained oscillatory

6. The closed-loop transfer function of a system is $\frac{C(S)}{R(S)} = \frac{S-2}{(S+1)(S+3)(S+4)}$. The system is

a) stable b) unstable [b]

c) marginally stable d) conditionally stable

7. The value of K for which the system $s^3 + 3s^2 + 3s + 1 + K = 0$ become marginally stable [b]

a) K > 8 b) K = 8 c) K = 7 d) K < 8

8. According to the Routh-Hurwitz criterion, the roots of a polynomial F(S) = 0 all lie in the left half of the s-plane if [b]

a) all the elements of the first row of the Routh's tabulation are of the same sign

b) all the elements of the first column are of the same sign

c) elements of the first row are of opposite sign alternatively

d) elements of the first column are of opposite sign alternatively

9. In Routh-Hurwitz criterion, if all the elements in one row is zero, then there are [d]

a) Total right hand poles in S-planed

b) Total left hand poles in S-plane

c) Total poles on jw axis

d) Symmetrical poles about imaginary axis

10. The open-loop transfer function of a control system has 5 poles and 3 zeros. The number of asymptotes is equal to [c]

a) 5 b) 3 c) 2 d) 8

11.for a bounded input if the output of the system is bounded then the system is [b]

a)unstable b)stable c)conditionally stable d)none

12. the meeting point of asymptotes is known as [a]

a)centroid b)break in point c)break away point d)crossing point on imaginary axis

13.in a third order system if all the poles are in right half of s plane then the system is[a]

a)unstable b)stable c)conditionally stable d)none

14. the path taken by the roots of characterstic equation is known as [a]

a)rootlocus b)bodeplot c)polar plot d)nyquist plot

15.for a bounded input if the output of the system is unbounded then the system is[a]

a)unstable b)stable c)conditionally stable d)none

16.in a third order system if all the poles are in left half of s plane then the system is[b]

a)unstable b)stable c)conditionally stable d)none

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

a) 0 b)2 c)5 d)10

18. If poles are added to the system, where will the system tend to shift the root locus? [b]

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

19. 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? [b]

a)2 b)3 c)5 d)6

20. Let P = Number of open loop poles and Z = Number of open loop zeros and P>Z, find the number of branches terminating at ∞ ? [c]

a)Z b)P C)(P-Z) D)(P+Z)

21.For a unity feedback system with G(s) = 10 / s2, what would be the value of centroid?

a. 0 [a]

b. 2

c. 5

d. 10

22.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]

b. To the right of an imaginary axis

c. At the center

d. No shifting takes place

23. 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? [b]

a. 2

b. 3

c. 5

d. 6

24.What should be the nature of root locus about the real axis? [b]

a. Assymetric

b. Symmetric

c. Exponential

d. Decaying

25.Which point on root locus specifies the meeting or collision of two poles?

a. Centroid [b]

b. Break away point

c. Stability point

d. Anti-break point

26.For drawing root locus, the angle of asymptote yields the direction along which _____branches approach to infinity. [b]

a. p + z

b. p - z

c. p / z

d. p x z

27.While specifying the angle and magnitude conditions, angles are added whereas magnitudes get _____ [b]

a. Subtracted

b. Multiplied

c. Divided

d. All of the above

28.Which condition is used to verify the existence of a particular point on the root locus?

a. Amplitude [d]

b. Frequency

c. Magnitude

d. Angle

29.Root locus specifies the movement of closed loop poles especially when the gain of system _____ [b]

a. Remains constant

b. Exhibit variations

c. Gives zero feedback

d. Gives infinite poles_

30.In second order system, which among the following remains independent of gain (k)?

a. Open loop poles [a]

b. Closed loop poles

c. Both a and b

d. None of the above

31. Routh Hurwitz criterion gives: [a]

a) Number of roots in the right half of the s-plane

b) Value of the roots

c) Number of roots in the left half of the s-plane

d) Number of roots in the top half of the s-plane

32. Routh Hurwitz criterion cannot be applied when the characteristic equation of the system containing coefficient's which is/are [d]

a) Exponential function of s

b) Sinusoidal function of s

c) Complex

d) Exponential and sinusoidal function of s and complex

33. Consider the following statement regarding Routh Hurwitz criterion: [d]

a) It gives absolute stability

b) It gives gain and phase margin

c) It gives the number of roots lying in RHS of the s-plane

d) It gives gain, phase margin and number of roots lying in RHS of the s-plane

34. The order of the auxiliary polynomial is always: [a]

a) Even

b) Odd

c) May be even or odd

d) None of the mentioned

35. Which of the test signals are best utilized by the stability analysis. [a]

a) Impulse

b) Step

c) Ramp

d) Parabolic

36. The characteristic equation of a system is given as3s4+10s3+5s2+2=0. This system is :

a) Stable [c]

b) Marginally stable

c) Unstable

d) Linear

37. The characteristic equation of a system is given ass3+25s2+10s+50=0. What is the number of the roots in the right half s-plane and the imaginary axis respectively? [b]

a) 1,1

b) 0,0

c) 2,1

d) 1,2

38. Consider the following statement: [a]

a) A system is said to be stable if its output is bounded for any input

b) A system is said to be stable if all the roots of the characteristic equation lie on the left half of the s plane.

c) A system is said to be stable if all the roots of the characteristic equation have negative real parts.

d) A second order system is always stable for finite values of open loop gain

39. The necessary condition for the stability of the linear system is that all the coefficients of characteristic equation 1+G(s)H(s) =0, be real and have the : [c]

a) Positive sign

b) Negative sign

c) Same sign

d) Both positive and negative

40. For making an unstable system stable: [b]

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

UNIT IV FREQUENCY RESPONSE ANALYSIS

1. The phase angle for the transfer function, G (jw) = $\frac{1}{(1+j\omega)^2}$ of corner frequency 1 is [c]

a) 45^0 b) -40^0 c) -90^0 d) 90^0

2. Frequency response test is not recommended for systems with [c]

a)very low time constants b) with small time constants c) with large time constants d) any time constants

3. M_r does not exits for [c]

a) $\varepsilon = 0$ b) $\varepsilon < 0.707$ c) $\varepsilon > 0.707$ d) all values of ε

4. The frequency of which the phase curve of a Bode plot crosses -180^0 line is called [a]

a) Phase cross over frequency b) Natural frequency

c) Gain cross over frequency d) Corner frequency

5. The frequency where M has a peal value is known as the [b]

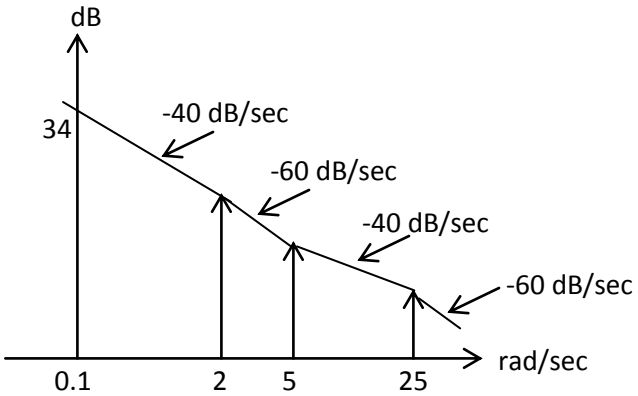
a) peak resonance b)resonant frequency c)normalized frequency d)none of these

6. The damping ratio ε of a system is 0.5. The value of M_r is [b]

a)2.308 b)1.54 c)1.01 d)none of these

7. The asymptotic approximation of the log-magnitude versus frequency of minimum phase system

with real poles and one zero is shown below its transfer function is [d]



a) $\frac{20(S+5)}{S(S+2)(S+25)}$ b) $\frac{10(S+5)}{S(S+2)^2(S+25)}$ c) $\frac{20(S+5)}{S^2(S+2)(S+25)}$ d) $\frac{5(S+5)}{S^2(S+2)(S+25)}$

8.For a second order system, ω_n=8 and ε =0.5. The value of ω_r in rad/sec is [b]

a)4.657 b)5.657 c)6.657 d) none of these

9.The normalized bandwidth for a particular value of ' ω_n ' and damping factor ' ε ' is

a) $\omega_n\sqrt{1-\varepsilon^2}$ b) $(\omega_n+\varepsilon^2)^{3/2}$ [d]

c) $\omega_n\left[1-2\varepsilon^2+\sqrt{2-4\varepsilon^2+4\varepsilon^4}\right]$ d) $\omega_n\left[1-2\varepsilon^2+\sqrt{2-4\varepsilon^2+4\varepsilon^4}\right]^{1/2}$

10.The gain margin of a system is 0dB. It represents a [d]

a) stable system b)unstable system c)conditionally stable d)marginally stable

11. For the pole factor 1/(s+5) , the corner frequency is [b]

a)1/5 b) 5 c) -5 d)-1/5

12.At the phase crossover frequency , ω =5 rad/sec , $|G(j\omega)H(j\omega)|$=10 dB. The system is[b]

a) stable b)unstable c)conditionally stable d)cannot be predicted.

13. At the phase crossover frequency , ω =10 rad/sec , $|G(j\omega)H(j\omega)|$= -8 dB. The system is[a]

a) stable b)unstable c)conditionally stable d)cannot be predicted.

14. At the gain crossover frequency , ω =6 rad/sec , $< G(j\omega)H(j\omega)$= -150°. The system is[a]

a) stable b)unstable c)conditionally stable d)cannot be predicted.

15. At the gain crossover frequency , ω =8 rad/sec , $< G(j\omega)H(j\omega)$= -195°. The system is[b]

a) stable b)unstable c)conditionally stable d)cannot be predicted.

16. At the phase crossover frequency , ω =10 rad/sec , $|G(j\omega)H(j\omega)|$=15 dB. Its gain margin is [c]

a) 15 dB b) 0 dB c) -15 dB d) cannot be predicted

17. At the phase crossover frequency , ω =7 rad/sec , $|G(j\omega)H(j\omega)|$=-12 dB. Its gain margin is

a) -12 dB b) 12 dB c) 0 dB d) cannot be predicted [b]

18. At the gain crossover frequency , ω =5 rad/sec , $< G(j\omega)H(j\omega)$= -170°.. Its phase margin is

a) $-10°$ b) $+10°$ c)- $170°$ d) $+170°$ [b]

19. At the gain crossover frequency , ω =12 rad/sec , $< G(j\omega)H(j\omega)$= -195°.. Its phase margin is

a) 15° b) -195° c)- 15° d) +195° [c]

20.Large values of gain margin and phase margin results in [c]

a) a fast system b) an unstable system c)a sluggish system d) an undamped system

21.A differentiator is usually not a part of a control system because it

(a) reduces damping [c]

(b) reduces the gain margin

(c) increases input noise

(d) increases error

22.A phase lag lead network introduces in the output [c]

(a) lag at all frequencies

(b) lag at high frequencies and lead at low frequencies

(c) lag at low frequencies and lead at high frequencies

(d) none of the above

23.___ technique gives quick transient and stability response [a]

(a) Root locus

(b) Bode

(c) Nyquist

(d) Nichols

24.The phase lag produced by transportation relays [c]

(a) is independent of frequency

(b) is inverseh'proportional to frequency

(c) increases linearly with frequency

(d) decreases linearly with frequency

25.In order to increase the damping of a badly underdamped system which of following compensators may be used ? [a]

(a) Phase-lead

(b) Phase-lag

(c) Both (a) and (b)

(d) Either (a) and (b)

(e) None of the above

26.___ technique is not applicable to nonlinear system ? [a]

(a) Nyquist Criterion

(b) Quasi linearization

(c) Functional analysis

(d) Phase-plane representation

27.Addition of zeros in transfer function causes which of the following ? [b]

(a) Lead-compensation

(b) Lag-compensation

(c) Lead-lag compensation

(d) None of the above

28.Phase margin of a system is used to specify which of the following ? [c]

(a) Frequency response

(b) Absolute stability

(c) Relative stability

(d) Time response

29.Which of the following is the best method for determining the stability and transient response ?

(a) Root locus [a]

(b) Bode plot

(c) Nyquist plot

(d) None of the above

30.The frequency and time domain are related through which of the following? [a]

(a) Laplace Transform and Fourier Integral

(b) Laplace Transform

(c) Fourier Integral

(d) Either (b) or (c)

31.Due to which of the following reasons excessive bond width in control systems should be avoided ? [c]

(a) It leads to slow speed of response

(b) It leads to low relative stability

(c) Noise is proportional to band width

(d) None of the above

32.Which of the following statements is correct for a system with gain margin close to unity or a phase margin close to zero ? [c]

(a) The system is relatively stable

(b) The system is highly stable

(c) The system is highly oscillatory

(d) None of the above

33.The magnitude & phase relationship between _____input and the steady state output is called as frequency domain. [c]

a. Step

b. Ramp

c. Sinusoidal

d. Parabolic

34. 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) [a]

b. c(t) = B cos (ωt + Φ)

c. c(t) = B tan (ωt + Φ)

d. c(t) = B cot (ωt + Φ)

35. Which unit is adopted for magnitude measurement in Bode plots? [b]

a. Degree

b. Decimal

c. Decibel

d. Deviation

36.In polar plots, what does each and every point represent w.r.t magnitude and angle?

a. Scalar [c]

b. Vector

c. Phasor

d. Differentiator

37. In polar plots, if a pole is added at the origin, what would be the value of the magnitude at ω= 0? [b]

a. Zero

b. Infinity

c. Unity

d. Unpredictable

38.Which plots in frequency domain represent the two separate plots of magnitude and phase against frequency in logarithmic value? [b]

a. Polar plots

b. Bode plots

c. Nyquist plots

d. All of the above

39. How is the sinusoidal transfer function obtained from the system transfer function in frequency domain? [c]

a. Replacement of 'jω' by 's'

b. Replacement of 's' by 'ω'

c. Replacement of 's' by 'jω'

d. Replacement of 'ω' by 's'

40.Due to an addition of pole at origin, the polar plot gets shifted by ___ at ω = 0? [c]

a. -45°

b. -60°

c. -90°

d. -180°

UNIT – V

STATE SPACE ANALYSIS

1. Which of the following statements regarding the state transition matrix is correct [d]

a. $\varphi(t1 + t2) = \varphi(t1) - \varphi(t2$

b.$\varphi(t1 + t2) = \varphi(t1) + \varphi(t2)$

c.$\varphi(0) = 0$

d. $\varphi(t1 - t2) = \varphi(t1)/\varphi(t2)$

2. The transfer function of a multi-input multi-output system, with the state space representation of [b]

$$\frac{dX}{dt} = Ax + Bu$$
$$Y = Cx + Du$$

Where x represents the state, y the output and u the input vector, will be given by

(*a*) $C^T (sI - A) B$

(*b*) $C(sI - A)^{-1} B + D$

(*c*) $(sI - A)^{-1} B + D$

(*d*) $C(sI - A)^{-1} B$

3. D. is called.. [d]

(a)system matrix (b)input matrix (c)output matrix (d)transmission matrix

4. Given a system represented by

$$\dot{X} = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} X1(t) \\ X2(t) \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U \; ; \; y(t) = [1 \quad 1] \begin{bmatrix} X1 \\ X2 \end{bmatrix}$$

The equivalent transfer function of system is [b]

a) $\frac{1}{(S^2 + 5S + 2)}$ b) $\frac{S-1}{S^2-4S+3}$ c) $\frac{3}{(S^2 + 3S + 2)}$ d) $\frac{2}{(S^2 + 3S + 2)}$

5. $\dot{X} = AX + BU$ is called the [b]

a)system equation b)state equation c)state transition equation d)none

6.The state transition matrix for the system $\dot{x} = Ax + Bu$ is given by [a]

a) e^{At} b) e^{-At} c) $\frac{1}{2} e^{At}$ d) $\frac{1}{2} e^{-At}$

7.The value of $\varphi(0) is$ [c]

a) 0 b)infinity c) I d)none of these

8.The transfer function approach is applicable to [a]

a)only linear time-invarient systems b)linear-invarient as well as time-varying systems

c)linear as well as nonlinear systems d)all systems

9.The state variable approach is applicable to [d]

a)only linear time-invarient systems b)linear-invarient as well as time-varying systems

c)linear as well as nonlinear systems d)all systems

10. In the state space model the marix c is called_____ [c]

(a)system matrix (b)input matrix (c)output matrix (d)none

11. In the state space model the marix A is called_____ [a]

(a)system matrix (b)input matrix (c)output matrix (d)none

12. $\dot{X} = AX$ is called _____ [a]

(a)homogeneous eqn (b)non homogeneous eqn (c)krammers eqn(d)none

13. $\dot{X} = AX + BU$ is called _____ [b]

(a)homogeneous eqn (b)non homogeneous eqn (c)krammers eqn(d)none

14. Characteristic equation roots in terms of eigen values is called ____ . [a]

(a)poles (b)zeros (c)time constant (d)none

15. Solution of state equation X(t)= _____ (homogeneous) [a]

(a) $e^{at}x(0)$ (b)e^{at} (c)x(0) (d) none

16. Initial conditions are considered in [b]

(a)Transfer function analasys (b)State space analasys (c)discrete analasys (d) none

17. Eigen values of A and $P^{-1}AP$ are _____ [a]

(a)same (b)different (c)not equal (d)none

18.Transition matrix $\Phi(t)$ satisfies the condition _____ [a]

(a) $\Phi(t_1+t_2)= \Phi(t_1).\ \Phi(t_2)$ (b) $\Phi(t_1+t_2)= \Phi(t_1)+ \Phi(t_2)$

(c) $\Phi(t_1+t_2)= \Phi(t_1)/\ \Phi(t_2)$ (d)none

19. The concept of controllability and observability were introduced by: [c]

a)Gilbert b)Gibson c)Kalman d)none of these

20. B. is called.. [b]

(a)system matrix (b)input matrix (c)output matrix (d)none

21. The transfer function technique is considered as inadequate under which of the following conditions ? [d]

(a) Systems having complexities and non-linearities

(b) Systems having stability problems

(c) Systems having multiple input dis¬turbances

(d) All of the above

22.___ can be extended to systems which are time-varying ? [d]

(a) Bode-Nyquist stability methods

(b) Transfer functions

(c) Root locus design

(d) State model representatives

23.The transfer function is applicable to which of the following ? [a]

(a) Linear and time-in variant systems

(b) Linear and time-variant systems

(c) Linear systems

(d) Non-linear systems

(e) None of the above

24. Conventional control theory is applicable to _____ systems [a]

a. SISO

b. MIMO

c. Time varying

d. Non-linear

25 State space analysis is applicable even if the initial conditions are _____[b]

a. Zero

b. Non-zero

c. Equal

d. Not equal

26. Which among the following are the interconnected units of state diagram representation?

a. Scalars [d]

b. Adders

c. Integrators

d. All of the above

27. Which among the following plays a crucial role in determining the state of dynamic system?

a. State variables [a]

b. State vector

c. State space

d. State scalar

28.Which among the following constitute the state model of a system in addition to state equations? [b]

a. Input equations

b. Output equations

c. State trajectory

d. State vector

29.State model representation is possible using _____ [d]

a. Physical variables

b. Phase variables

c. Canonical state variables

d. All of the above

30) Which mechanism in control engineering implies an ability to measure the state by taking measurements at output? [b]

a. Controllability

b. Observability

c. Differentiability

d. Adaptability

31) According to the property of state transition method, e0 is equal to _____ [a]

a. I

b. A

c. e-At

d. -eAt

32) Which among the following is a disadvantage of modern control theory? [d]

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

33) Which among the following is a unique model of a system? [a]

a. Transfer function

b. State variable

c. Both a and b

d. None of the above

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36.Which mechanism in control engineering implies an ability to measure the state by taking measurements at output? [b]

a. Controllability

b. Observability

c. Differentiability

d. Adaptability

37. The transfer function for the state representation of the continuous time LTI system:dq(t)/dt=Aq(t)+Bx(t)

Y(t)=Cq(t)+Dx(t)is given by [a]

:a) C(sI-A)-1B+D

b) B(sI-A)-1B+D

c) C(sI-A)-1B+A

d) D(sI-A)-1B+C

38.State space analysis is applicable for non-linear systems and for multiple input and outputsystems [a]

.a) True

b) False

39) It is not possible to convert state model to transfer function [b]

a)True

b)False

40) A state model consists of [d]

a) Transfer function

b)State equation

c)output equation

d)both b and c