MSMF GATE CENTRE

Subject: Control Systems

(Root Locus Diagram & Frequency Response Analysis)

Test 4

Time: 35 min **Marks= 30**

1. Root locus diagram

   (a) starts at zeros(k=0) and terminates at poles(k=∞)of the OLTF
   (b) starts at poles(k=∞) and terminates at zeros(k=0) of the OLTF
   (c) starts at poles(k=0) and terminates at zeros(k=∞) of the OLTF
   (d) starts at zeros(k=∞) and terminates at poles(k=0)of the OLTF

   Where k=gain of the system

2. OLTF of a unity feedback system is $T(s) = \frac{50(s^2+4)}{(s+2)^2(s+4)}$ for k=∞ the closed loop poles are

   (a) -2,-2,-4 (b) j2, -j2 , ∞
   (c) -4, j2,-j2 (d) -2,-2, ∞

3. Centroid lies on the

   (a) negative real axis
   (b) positive real axis
   (c) imaginary axis
   (d) real axis

4. Break away point lies on the

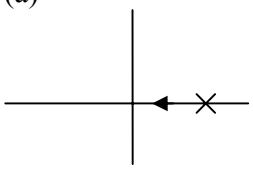
   (a) negative real axis
   (b) positive real axis
   (c) real axis
   (d) none of the above

5. $OLTF = \frac{10s(s+2)}{s^2+2s+2}$ the angle of arrival of the RLD at s=-2 is

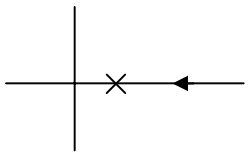
   (a) 0^0
   (b) 180^0
   (c) 90^0
   (d) none of the above

6. TF $= \frac{k}{(4-s)}$ the RLD is

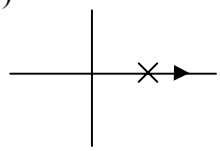
(a)



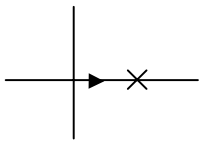
(b)



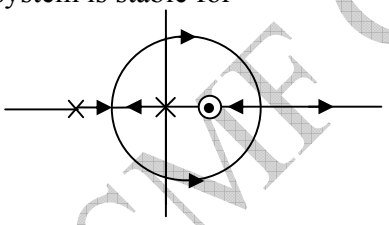
(c)



(d)



7. RLD of a system is given below, system is stable for



(a) $0<k<\infty$ (b) $0<k<10$
(c) $10<k<20$ (d) $-10<k<20$

8. OLTF $\frac{k(s^2+16)}{s(s^2+4)}$

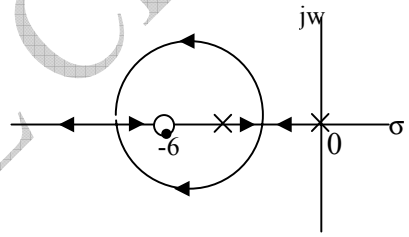
$s_1=j3$, $s_2=-5$

(a) s_1 is on the root locus, but not s_2
(b) s_2 is on the root locus, but not s_1
(c) both s_1 and s_2 are on the root locus
(d) neither s_1 nor s_2 is on the root locus

9. The CLTF of an unity feedback system is $\frac{k}{(S+2+k)}$ on the RLD the value of k at s= -6 is $(0<k<\infty)$

a) 4 (b) 6
c) 2 (d) none

10. The RLD for k=0 to ∞ is given below Break away/in points are



(a) -4, -2
(b) -8, -6
(c) -2,-10
(d) -8,-12

11. OLTF is given as

$$G(s)H(s) = \frac{k(s+4)}{s(s^2+6s+13)}$$

RLD intersects the imaginary axis

(a) at s= j2
(b) for k=38.2
(c) at s=-j3
(d) none of the above

Linked data questions 12 and 13

CLTF of an unity feedback system is

$$\frac{k(s+3)}{s(s+2)+k(s+3)}$$

12. The break away/in points on the RLD are

(a) -1.27,-4.73 (b) -1.3, -5.3
(c) -1.5, -5.5 (d) -1,- 6.2

13. For complex RLD, the diameter of the circle is

(a) 4 (b) 3.46
(c) 5.2 (d) 4.56

Common data questions 14 and 15

Characteristic equation of a system is given by $s^3+30s^2+16s+16k=0$

14. The point of intersection of the RLD with respect to imaginary axis is

(a) 2 (b) 4
(c) 6 (d) 8

15. The numbers of asymptotes are

(a) 2 (b) 3
(c) 1 (d) 0

16. With respect to frequency response the true statement(s) is/are

(a)is the steady state output to the sinusoidal input
(b)input is sinusoidal and output is also sinusoidal
(c)output amplitude and phase depends on the system
(d)all the above

17. If the transportation lag is introduced into the system, stability of the system

(a) remains same
(b) increases
(c) decreases
(d) increases and then decreases

18. The gain of the system is made half gain margin

(a) reduces by 6dB
(b) increases by 2
(c) increases by 2dB
(d) decreases by 2

19. TF of a unity feedback system is $\frac{1}{s^2+s+1}$ the magnitude of the system at 0.1591Hertzs is approximately

(a) 0dB (b) 1dB
(c) 2dB (d) 3dB

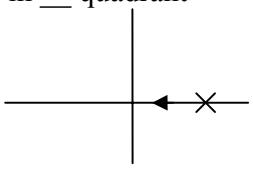
20. The peak overshoot of a 2^{nd} order protype system to a step input is zero, the resonant peak of the system is

(a) 0 (b) 1
(c) 2 (d) 3

21. The system is stable for 0<k<20,the gain margin of the system for k=10 is

(a) 10dB (b) 6dB
(c) 12dB (d) 3dB

22. The RLD is shown below, the polar plot lies in __ quadrant



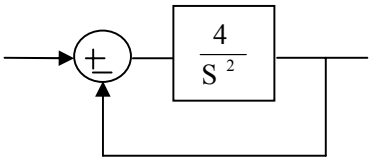
(a) 1^{st} (b) 2^{nd}
(c) 3^{rd} (d) 4^{th}

23. The initial and final slopes of a bode plot of a certain 2^{nd} order all pole

minimum phase system is -20dB/dec and -40dB/dec, the system is stable for

(a) $-\infty<k<\infty$ (b) $-\infty<k<0$
(c) $0<k<\infty$ (d) can't say

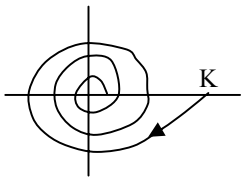
24.



Gain and phase margins of the above system are respectively

(a) $-1,180^0$ (b) $1,-90^0$
(c) $-1,180^0$ (d) $1, 0^0$

25. The TF of a system whose polar plot is given below is

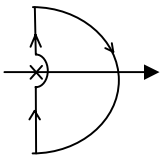


(a) $\frac{Ke^{-ST_D}}{(1+ST)}$
(b) $\frac{Ke^{-sT_D}}{S(1+ST)}$
(c) $\frac{Ke^{-sT_D}}{S^2(1+ST)}$
(d) $\frac{Ke^{-sT_D}}{S}$

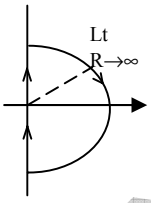
26. OLTF $G(s)H(s)=\frac{K(S+2)}{S(S^2+4)}$

The Nyquist contour is

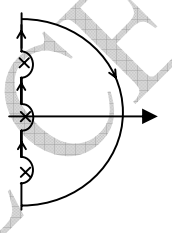
(a)



(b)



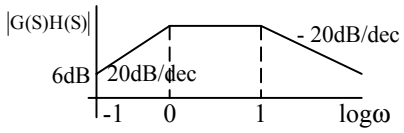
(c)



(d) All the above

Linked data questions 12 and 13

The Bode plot of a system is given below



27. The TF G(s)H(s) is

(a) $\frac{20s}{(1+s)(s+10)}$

(b) $\frac{200s}{(1+s)(1+0.1s)}$

(c) $\frac{10s}{(1+s)(s+10)}$

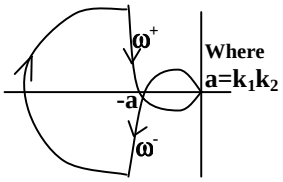
(d) $\frac{20s}{(1+s)(1+0.1s)}$

28. The gain of the closed loop system at ω=0 is

(a) 0dB (b) 0
(c) 1dB (d) none

Common data questions 29 and 30

The Nyquist plot of G(s)H(s) which has one right hand pole is given below



29. The system is stable for a=

(a) 0.2 (b) 0.5
(c) 1 (d) 1.5

30. If a=10 phase margin is

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