Register Number……………………

B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Fifth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U07EI502: Control Systems

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. In the case of an armature controlled DC motor, if the equivalent moment of inertia of the motor & the load is made small, then the motor tends to act like

   a) Differentiating circuit b) Integrating circuit

   c) PID controller d) II order critically damped system

2. A linear time invariant system, initially at rest when subjected to a unit step input gave a response $c(t) = t\,e^{-t}$ $(t \geq 0)$. The transfer function of the system is

   a) $s/(s+1)^2$ b) $1/s(s+1)^2$ c) $1/(s+1)^2$ d) $1/s(s+1)$

3. Type of the system depend on the

   a) Number of poles b) Difference between number of poles & zeros

   c) Number of its real poles only d) Number of poles it has at origin

4. With derivative feedback control

   a) a second order system is converted into a first order system

   b) a second order system is converted into a third order system

   c) Natural Frequency of oscillation changes

   d) Damping ratio is increased

5. The gain margin of the II order system is

   a) Zero b) Infinite c) Between Zero & Infinite d) One

6. For the Routh table shown below, the number of roots lying on the right side if S-Plane is

S^4	1	10	5
S^3	2	10	

   a) Zero b) 2 c) 3 d) 4

7. A system has 14poles and 2 zeros. The shape of its highest frequency asymptote in its magnitude plot is

   a) −40 db/dec b) −240 db/dec c) −280 db/dec d) −320 db/dec

8. If the coefficient of the characteristic polynomial is positive then the system is

   a)Marginally Stable b) Stable c) Unstable d) Un predictable

9. The requirement for BIBO stability is that $\int_0^\infty m(\tau)\,d\tau$ should be

   a) $-\infty$ b) $+\infty$ c) $< \infty$ d) $> \infty$

10. ___________________ controller makes a system less sensitive to parameter variations

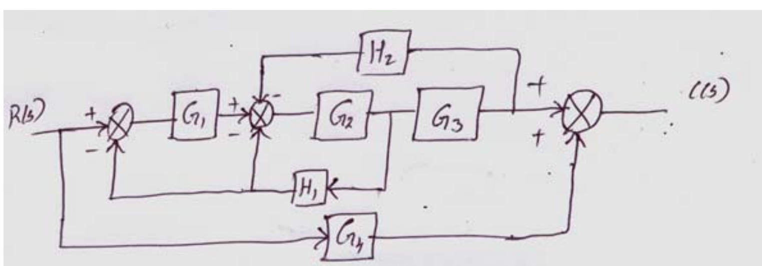
a) P controller b) I controller c) D controller d) PI controller

PART B (10 x 2 = 20 Marks)

11. Find the transfer function C(s) / R(s) for the signal flow graph shown below.
12. What is the difference between open loop and closed loop system?
13. What is meant by steady state error?
14. What do you mean by settling time?
15. What is necessary & sufficient condition for a system to be stable?
16. What is the effect of addition of pole & zero?
17. What do you man by gain margin and phase margin?
18. How do you determine the closed loop response from the open loop response?
19. What is meant by reset rate?
20. Write the transfer function of PI & PD controller?

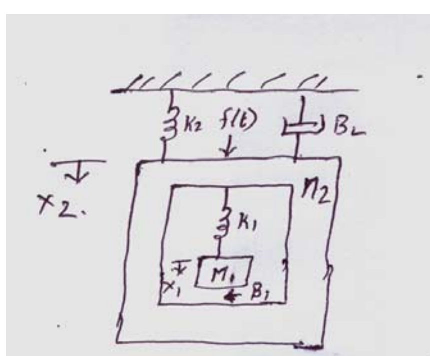
PART C (5 x 14 = 70 Marks)

21 a) Obtain the closed loop transfer function C(s)/R(s) for the system whose block diagram shown below.



(OR)

b) Write the differential equations governing the mechanical system shown below. Draw the force voltage and force current analogous circuit and verify the same using mesh and node equation.



22 a) Derive the response of the second order system for underdamped case and when the input is Unit step.

(OR)

b) For a unity feedback control system, the open loop transfer function is

$$G(s) = 10(s+2)/(s^2(s+1)).$$

Find (i) K_p, K_v, K_a

(ii) the steady state error when $R(s) = 3/s - 2/s^2 + 1/3s^3$.

23 a) Sketch the bode plot for the following transfer function and determine the gain margin and phase margin. $G(s) = 75\ (1+0.2s)\ /\ s\ (s^2+16s+100)$

(OR)

b) Sketch the polar plot and determine the gain margin and phase margin for

$$g(s) = 1\ /\ s^2(1+s)(1+2s).$$

24 a) The characteristic polynomial of the system is

$$s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0.$$

Determine the location of roots on s-plane and hence the stability of the system.

(OR)

b) Briefly explain the procedure for investigating the stability using nyquist criterion.

25 a) Briefly explain with neat diagram the PD Controller with analysis for the same.

(OR)

b) Explain with neat block diagram the various blocks in level control loop using analogue controller.

****