Department of Electrical Engg.

B.Tech - V Semester

Sub:- Control System

Sessional Test - I

Time:- 01 Hr. M.M. - 30

Note:- Attempt all questions.

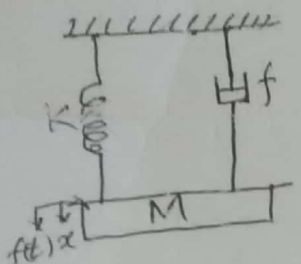
Q.I (a) Differentiate openloop Control System and closed loop Control System. (2)

(b) Explain any two feedback control system in which a human acts as a Controller. (3)

(c) Define Controlled variable and Manipulated variable with example. (2)

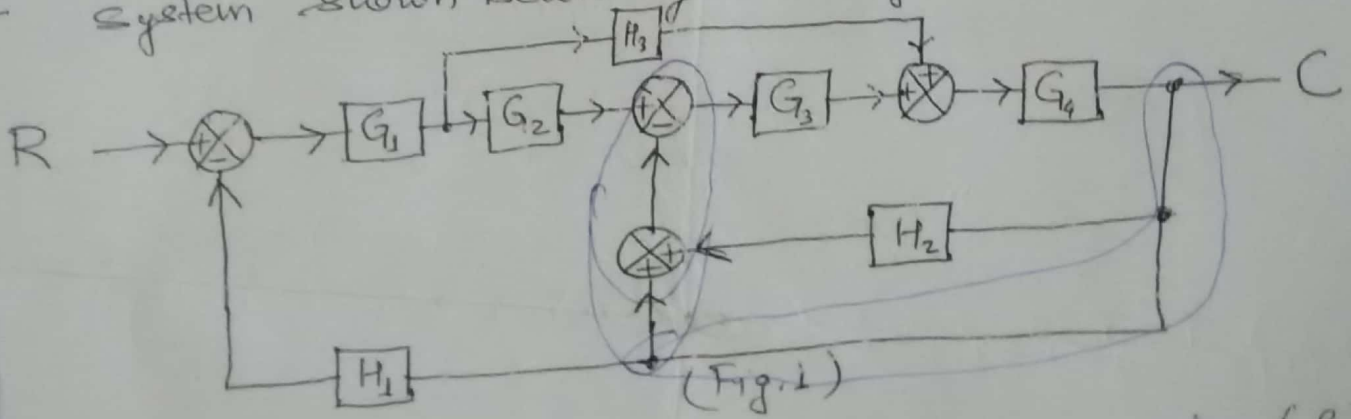
(d) How the summing point is eliminated in a closed loop System ? Explain. (2)

(e) Draw the mechanical circuit diagram of the given System and find its transfer function. (3)



$v(t) = L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{1}{C}q$

Q.II Determine the overall transfer function of the System shown below by block diagram reduction technique. (10)



(Fig. 1)

Q.III Draw the Signal flow graph of the above given System and verify the results by using Mason's gain formula. (8)

SESSIONAL TEST I

B. Tech (IIIrd Yr) — Control Systems (EES-503)

Vth SEM. — MAX. MARKS: 30

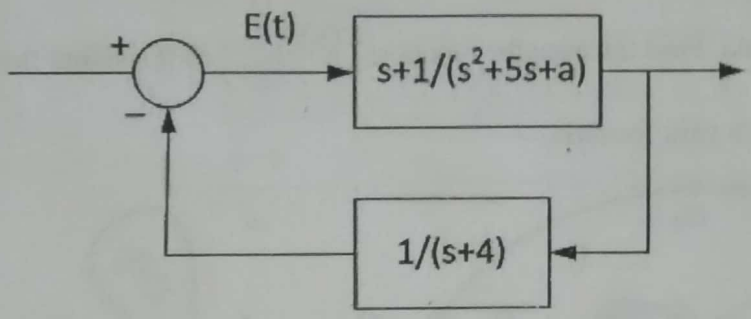
NOTE: ATTEMPT ALL QUESTIONS

PART I: EACH QUESTION CARRIES 2 MARKS

(1)

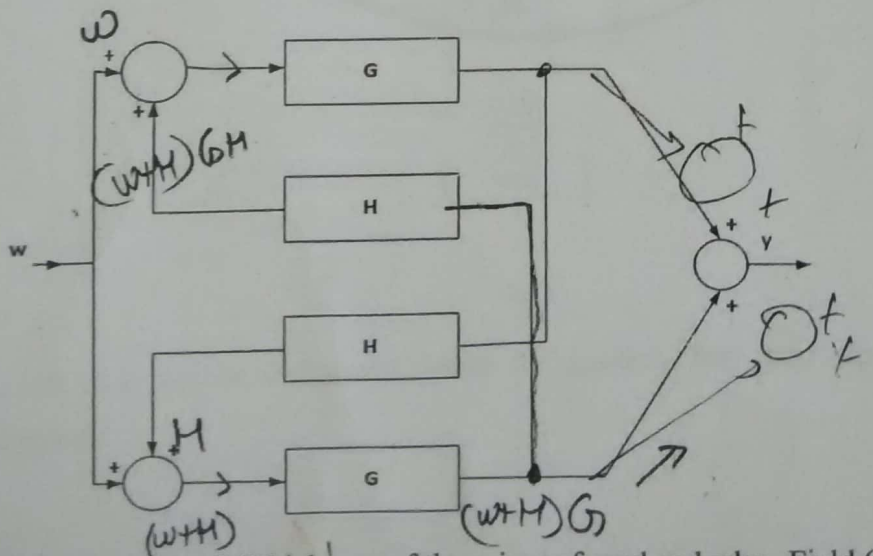
a) How do you counter a disturbance with the help of a control system?

b) For what values of 'a' does the system shown in figure have zero steady state error [i.e. $\lim_{t\to\infty} E(t)$] for step input?



c) What is an error detector? In what case the error will not be the difference between the input and output.

d) Find the overall transfer function of the system shown in figure given below.

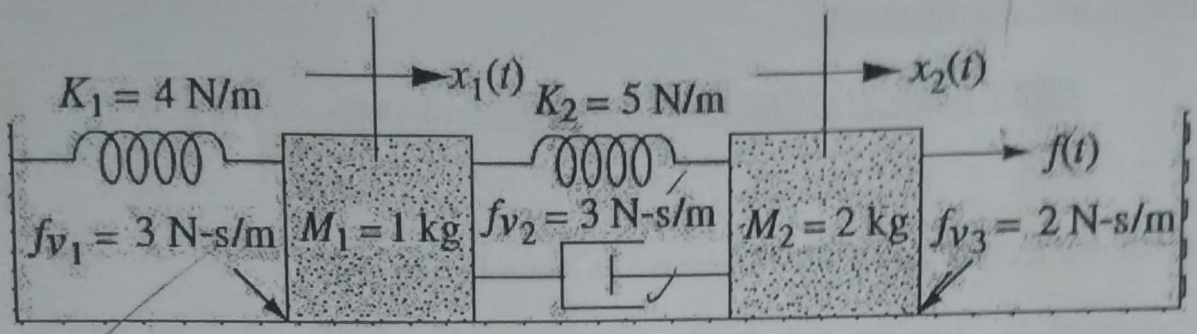


e) What is a servomotor? Which one of them is preferred and why--Field Control or armature control?

PART II: EACH QUESTION CARRIES 5 MARKS

(2)

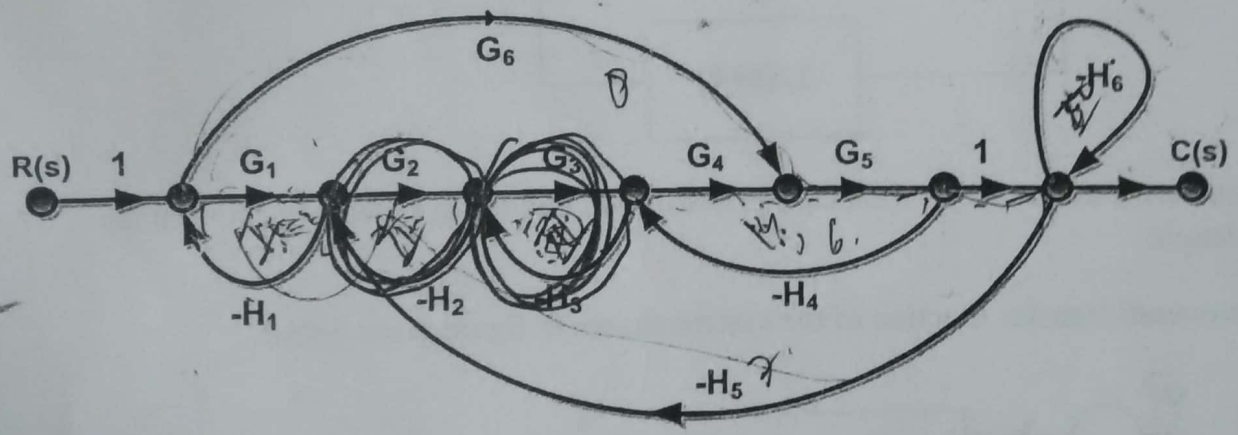
a) For the system shown in Fig. Find the transfer function $G(s) = X_1(s)/F(s)$



b) Explain how a pneumatic system works and its application?

PART III: EACH QUESTION CARRIES 10 MARKS

(3) State Mason's gain formula. Find the transfer function $C(s)/R(s)$ of the signal flow graph shown in figure using Mason's gain formula.



Department of Electrical Engineering
B.Tech.(Electrical Engg.) – V Semester

Sessional Test-I | Sub: Control System | Sept., 2013
Time: 1 Hour | M.M.: 15

Attempt any three questions.

Q1. Write the differential equations governing the Mechanical rotational system shown in fig.1. Draw the Torque-current electrical analogous circuits.

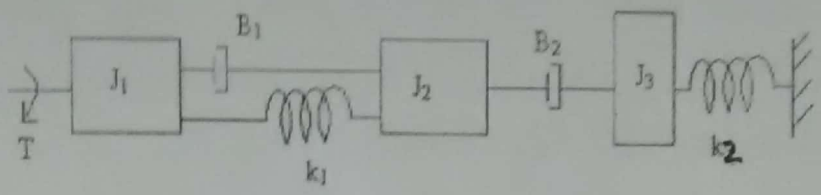


Fig.1

Q2. Find X1(s)/F(s) for the mechanical system shown in fig.2.

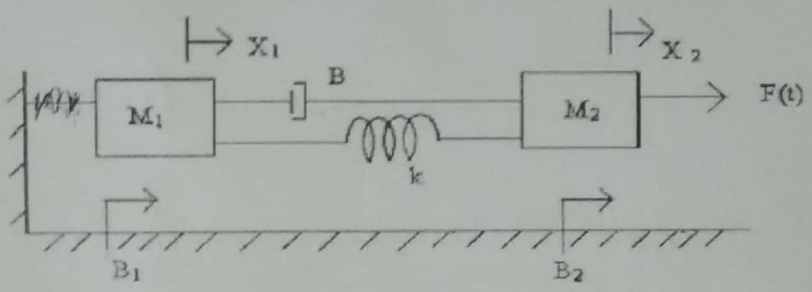


Fig.2

Q3. Obtain the nodal equations for the system shown in fig. 3

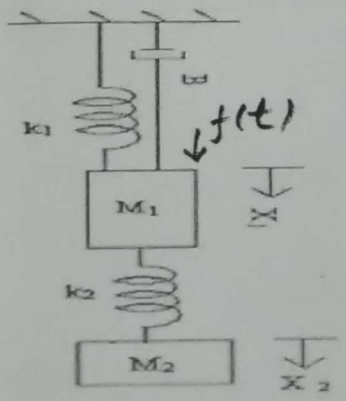


Fig.3

Q4. Discuss the servomechanism used to position the load shaft with necessary diagram.

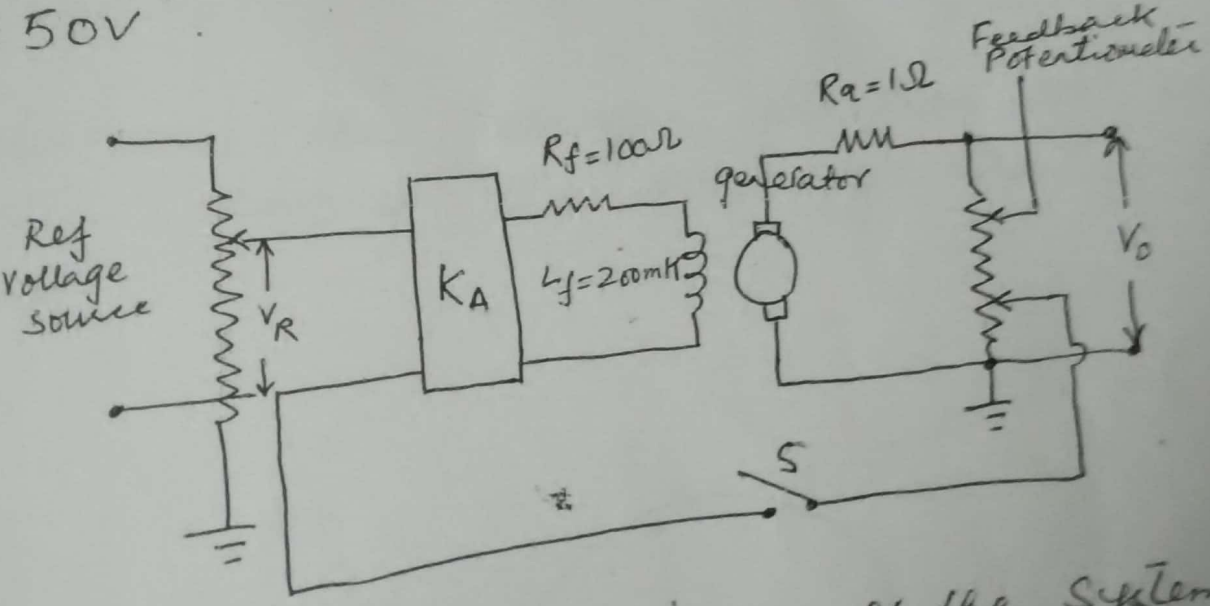
B. Tech (Electrical) V-SEM

SUB: CONTROL SYSTEM, EES-503

MM - 30

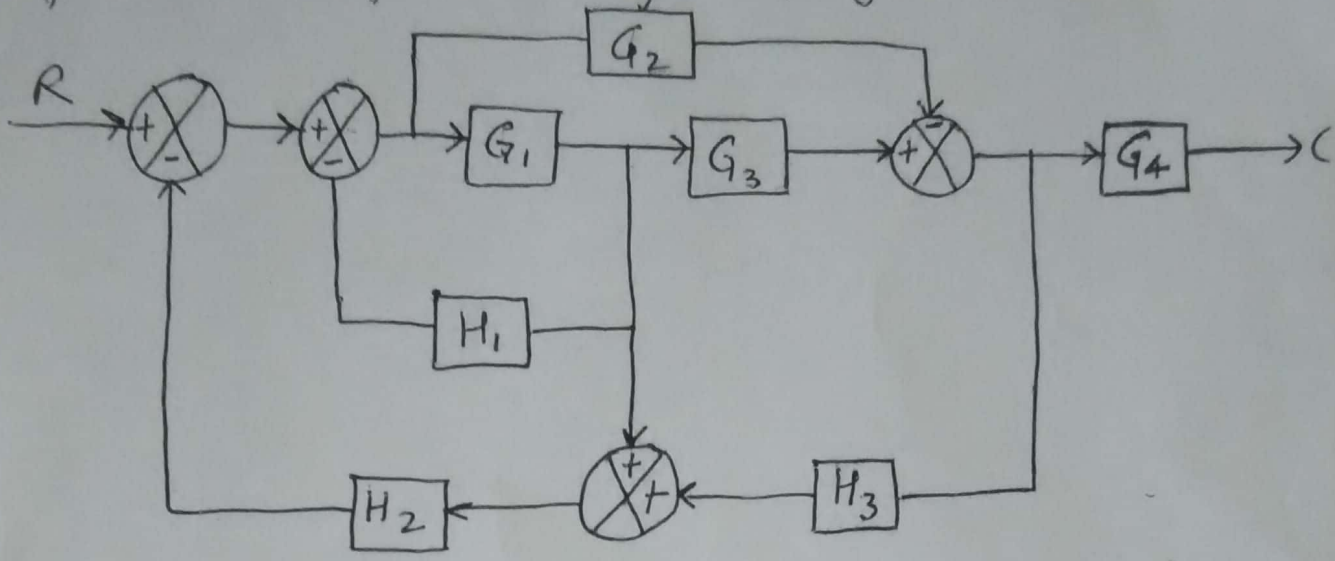
Attempt all questions

Q1. A simple voltage regulator is shown below. A potentiometer is used at the output terminals of the generator to give a feedback voltage KV_o where K is constant ($K \leq 1$). The potentiometer resistance is high enough that it may be assumed to draw negligible current. The amplifier has a gain of 20 volts/v. The generator gain is 50 volts/field amp. Reference voltage $v_r = 50V$.

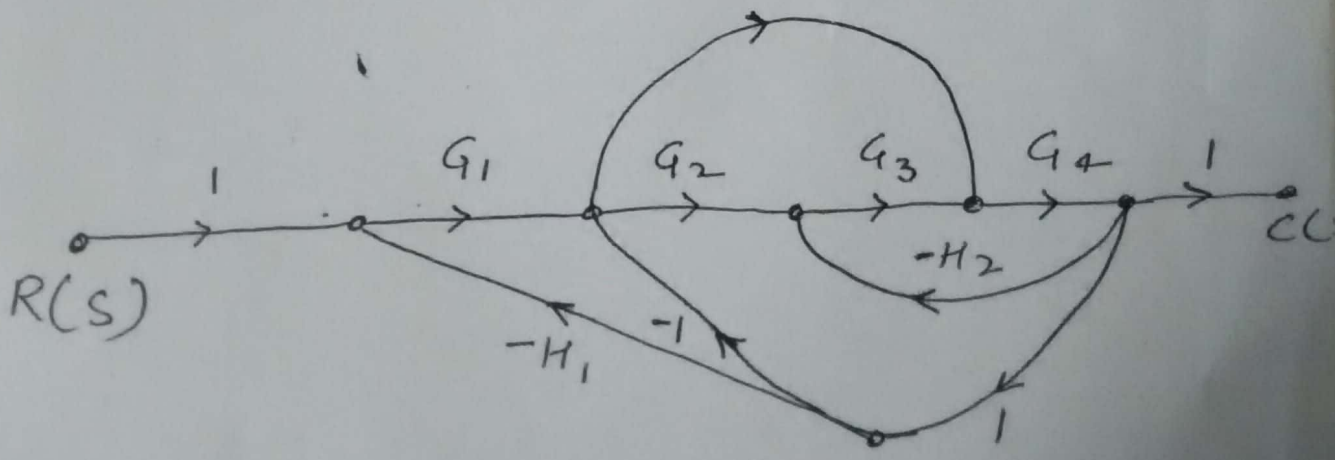


(a) Draw the block diagram of the system when the generator is supplying load current. Indicate the transfer function of each block.

Q2. Obtain the simplified block diag of the following figure.



Q3. Determine the transfer function of the system having the following signal flow graph.



B Tech (Electrical Engg.) - V Sem

2nd Sessional Test

Control Systems

Time: 01 Hr. M.M.: 30

Note:- Attempt all questions.

Q.I. (a) What is the difference between Routh stability Criterion and Hurwitz's stability criterion? (2)

(b) Check the observability of the system given below: - (2)

$\dot{x}_1 = -2x + x_2 + 4$, $\dot{x}_2 = -2x_2 + 4$ & $y = x_1 + x_2$ (2)

(c) What is Relative stability? Compare with absolute stability. (2)

(d) Explain the following:-

(1) State Vector (2) State variable.

(e) Define the Sensitivity of the roots of the characteristic equation for a Control System. (2)

Q. II (i) Using Routh Criterion investigate the stability of unity feedback control system whose open loop transfer function is - (5)

$$G(s) = \frac{e^{-sT}}{s(s+2)}$$

(ii) Obtain the state space equations for the transfer function given - (5)

$$G(s) = \frac{10(s+1)}{(s+4)(s+2)^2}$$

Q. III The open-loop transfer function of a control system is given by (10)

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

Sketch the root locus and determined

(i) Break away points

(ii) angle of departure from complex poles

(iii) the stability condition.

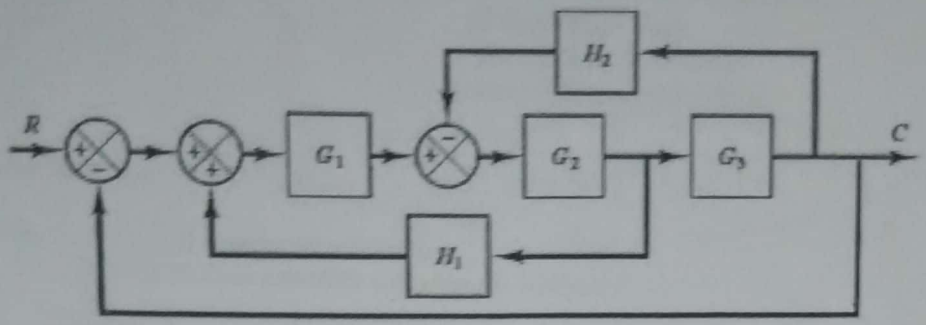
Department of Electrical Engineering
B.Tech.(Electrical Engg.) – V Semester
Sub: Control System

essional Test-II
Time: 1 Hour

Oct., 2013
M.M.: 15

Attempt any three questions.

Q1. For the system shown in figure, Obtain C/R using block diagram reduction technique



Q2. Derive the time response of underdamped and critically damped second order system for unit step input.

Q3. For a system having $G(s)H(s) = \frac{K(s+4)}{s(s^3+5s^2+6s)}$

Find (i)The type of the system (ii)Static error constants (iii)Error due to $\frac{A}{2}t^2$

Q4. For a unity feedback system $G(s) = \frac{25}{s(s+10)}$

Find (i)ω_n (ii) ξ (iii) ω_d (iv) T_p (v) M_p

Department of Electrical Engineering
II Sessional Test
(B. Tech-V Semester)
Control Systems(EES-503)

Time One Hour **Maximum Marks: 30**

Note: i) Answer all questions.
ii) Only scientific **calculator** is allowed.

Question No.1: Answer the following questions **(5 x 2)**

1. A unity feedback system has $G(s) = \frac{180}{s(s+6)}$ and r(t) = 4t.. Determine the steady state error.

2. Determine the values of damping ratio & natural frequency of oscillations for the given system & hence specify the nature of the response.
$$\frac{c(s)}{R(s)} = \frac{10}{(s+2)(s+5)}$$

3. A feedback system has $G(s)\,H(s) = \frac{1}{(s^2+s+2)(s+1)}$ .Determine K_p & e_{ss} for unit step input.

4. Determine the stability of the system whose characteristic equation is given by
$2s^4 + 2s^3 + s^2 + 3s + 2 = 0$

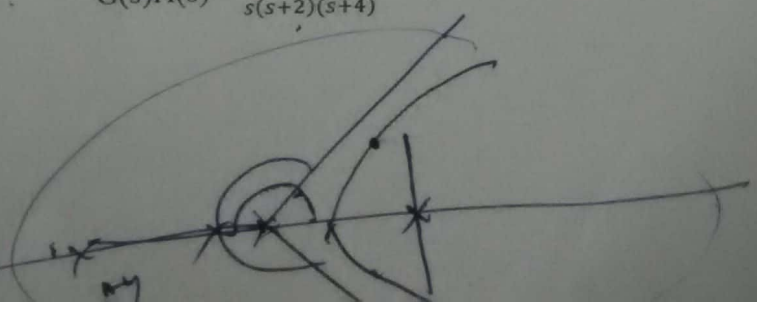
5. Find the Polar plot of $G(s) = \frac{1}{s(1+sa)}$.

Question-2. Solve the following questions **(2 x 5)**

1. The open loop transfer function of a unity feedback control system is given by
$$G(s) = \frac{k}{(s+1)(1+2s)(1+3s)s}$$
Determine the value of k for which the system is stable.

2. Sketch the Bode plot for the transfer function $G(s)\,\frac{1000}{(1+0.1s)(1+0.001s)}$ .Determine the
(a) Phase Margin
(b) Gain margin
(c) Stability of the system

Question-3 Sketch the Root locus plot for the system when open loop transfer function is given by
$$G(s)H(s) = \frac{k}{s(s+2)(s+4)}$$ **(1 x 10)**



B. Tech (Electrical) V Semester
Control System

II Sessional 2011

Max Marks: 20 **Max Time: 1 hr**

Attempt any two questions

1. The open loop transfer function of a unity feed back system is

$$G(s) = \frac{k}{s(s+2)(s+4)(s+8)}$$

Based on Routh criterion find the range of 'k' such that the closed loop system is absolutely stable. **(2+4+4)**

2. The forward path transfer function of a unity feedback system is given by

$$G(s) = \frac{k}{s(s+1)(s+3)}$$

Sketch the root locus as 'k' varies from zero to infinity. Comment on the stability of the system **(2+4+4)**

3. Obtain the unit step response of a unity feedback system whose open loop transfer function

$$G(s) = \frac{4}{s(s+5)}$$

also find its damping ratio rise time, peak time, settling time and maximum overshoot **(2+4+4)**