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GAIN MORE KNOWLEDGE
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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST - 1

Even Semester: 2018-19 | **Date**: 06 March 2019

Course Code: MEC 324 | **Time**: 1 Hour

Course Name: Control Engineering | **Max Marks**: 40

Programme & Sem: VIII (Mech Engg) | **Weightage**: 20%

Instructions:

*(i) **Answer all the questions from Part A, B and C with internal choice***

Part A

1. With the help of a neat block diagram explain the working of a closed loop control system for room cooling.

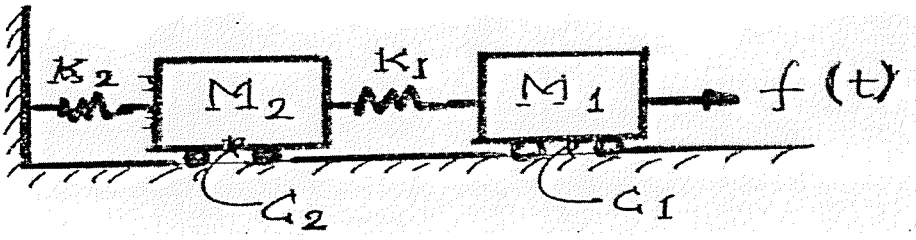
OR

Explain PID controller with its characteristic curve and advantages

(10 Marks)

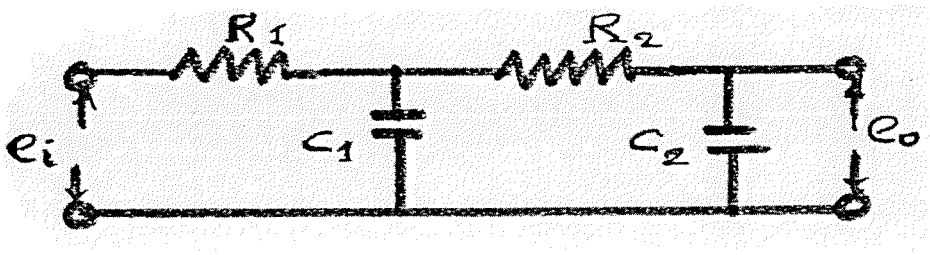
Part B

2. Find the transfer function of the mechanical translational system as shown in fig. below.



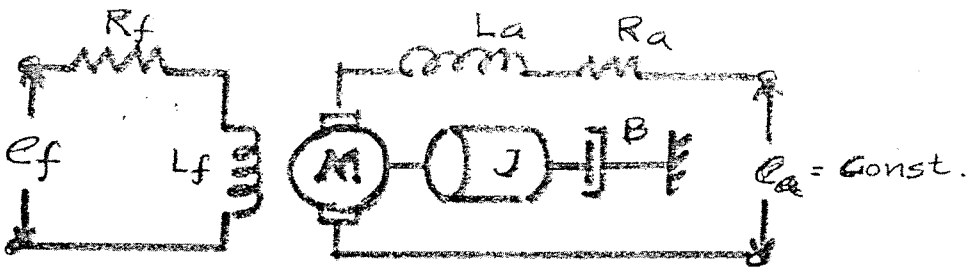
OR

Find the transfer function of the electrical network as shown in the figure below.



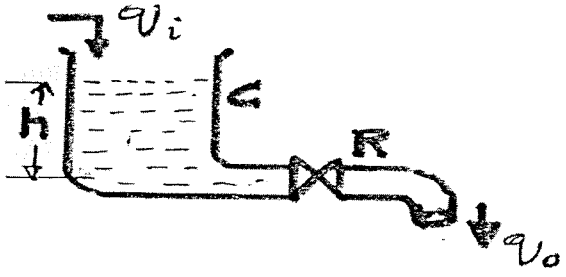
(10 Marks)

3. Find the transfer function of the field controlled DC motor as shown in the figure below.



OR

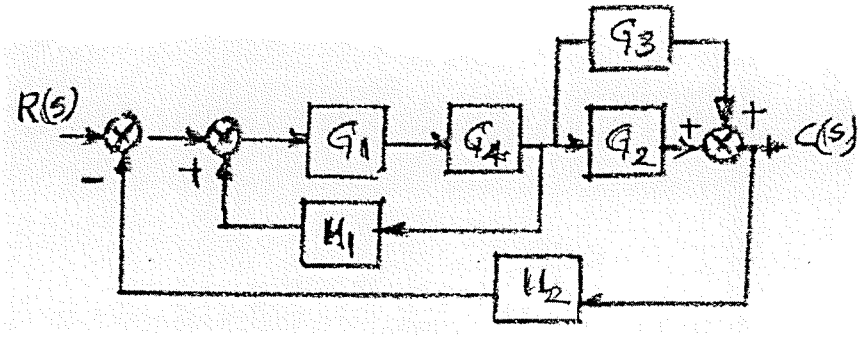
Find the transfer function of the hydraulic (liquid level) system as shown in the figure below.



(10 marks)

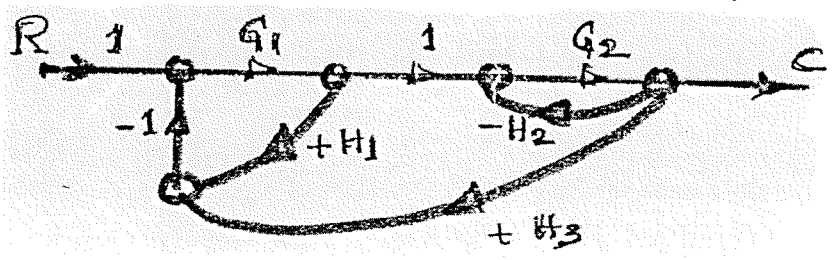
Part C

4. Reduce the block diagram as shown in the fig. and find the transfer function.



OR

Find the transfer function for the signal flow graph as shown in the figure below.



(10 Marks)

********END **********

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GAIN MORE KNOWLEDGE
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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST - 2

Even Semester: 2018-19 | **Date**: 16 April 2019

Course Code: MEC 324 | **Time**: 1 Hour

Course Name: Control Engineering | **Max Marks**: 40

Program & Sem: B.Tech & VI/VIII Sem (DE) Group-I | **Weightage**: 20%

Instructions:

(i) All Plots should be Neat & Tidy.

Part A

Answer **any two** the Questions. **Each** Question carries **three** marks. (2Qx3M=06)

1. Discuss the types of Standard Input signals
2. Explain R-H Criteria.
3. State Nyquist Criterion for Stability

Part B

Answer **both** Questions. **(Either Q4 or Q5 and Q6 or Q7)**

Each Question carries **ten** marks. (2Qx10M=20)

4. Sketch the Polar plot given

$$G(S)= 1.0 / (1+TS)$$

OR

5. Sketch Nyquist Plot given $G(S)H(s) = (1+4s) /S^2(1+S)(1+2S)$
6. Derive Time response of First Order System for Unit impulse & Unit Step Inputs.

OR

7. Derive Time Response of Second Order System for Unit Step Input for

   (i) Undamped (ii) Critically Damped

Part C

Answer **any one** Question. The Question carries **fourteen** marks. (1Qx14M=14)

8. Draw the Root Locus for:

$$G(S)H(S)= K / (S)(S+2)(S+3)$$

OR

9. $G(S)H(S) = K(S+1)/(S^3+4S^2+6S+4)$

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Even Semester: 2018-19 | **Date**: 23 May 2019

Course Code: MEC 324 | **Time**: 3 Hours

Course Name: Control Engineering | **Max Marks**: 80

Program & Sem: B.Tech & VI & VIII Sem | **Weightage**: 40%

Instructions:

(i) Answer questions from part A, B and C as per the choices given.

Part A

1. Answer **all the** Questions. **Each** question carries **one** mark. (10Qx1M=10M)

(i) Transfer function is defined as
   a) Laplace transform of input and output
   b) ratio of laplace transform of output to input
   c) None
   d) ratio of laplace transform of input to output

(ii) The major challenge of closed loop control system is
   a) Stability b) Precision control c) None d) Frequency response

(iii) Closed loop transfer function of system having forward gain G(S) with unity feedback is
   b) $\frac{G(S)}{1+G((S)}$ b) G(1) c) None d) $\frac{1+G(1)}{G((S)}$

(iv) Spring-mass-damper system is equivalent to electrical system namely
   a) R-C b) R-L c) R-L-C d)none

(v) Mason gain formula is used to determine
   a) Damping coefficient c) overall transfer function
   b) None d) both (a) and (b)

(vi) Open loop control system posses
   a) Good Stability b) Better response c) None d) Better control

(vii) Routh-Hurwitz criteria is used to
   a) Determine stability b) Determine frequency c) Both d) None

(viii) Bode plots are used to determine
   a) Phase Margin b) gain Margin c) both (a) and (b) d) None

(ix) Root locus plots are used to determine the
   a) stability of system b)frequency response c)both (a)and (b) d) None

(x) Nyquist plots are used to determine
   a) Phase response b) frequency response c) Both d) none

2. Answer **all the** Questions. **Each** question carries **two** marks. (5Qx2M=10M)

(i) Determine the critical value of gain K, given the characteristic equation as S^3+4S^2+3S+K

a) K=0 b) K>1 c) K=12 d) K=6

(ii) If $G(S)H(S)=\frac{S}{(S+2)+(S+3)}$, the final resultant slope will be

a) +20 b) -20 c) 0 d) 40

(iii) If $G(S)H(S)=\frac{20}{S(S+2)}$, the final resultant phase angle will be

a) -180 b) 0^0 c) 180 d) 90

(iv) The root locus of the system where transfer function is $\frac{K}{S(S+2)(S+3)}$, lies on the real axis between

a) 0 and -2 c) -3 to minus infinity

b) both (a) and (b) d) None

(v) Do the break point of root locus for the system $\frac{K}{S(S+1)}$, exists or not, if it exits then choose the correct one

a) Lies between s=0 and s= 2, c) lies between -1 to minus infinity

b) Lies on S=0 d) none

Part B

Answer **any two** Questions. **Each** question carries **fifteen** marks. (2Qx15M=30M)

3. a) Define transfer function.

b) Determine the transfer function of the mechanical linear system as shown in the figure.1

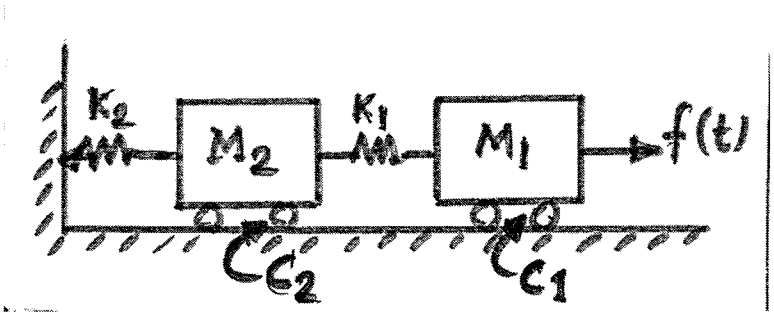

Figure 1

OR

4. Determine the transfer function of the electrical network as shown in the figure 2.

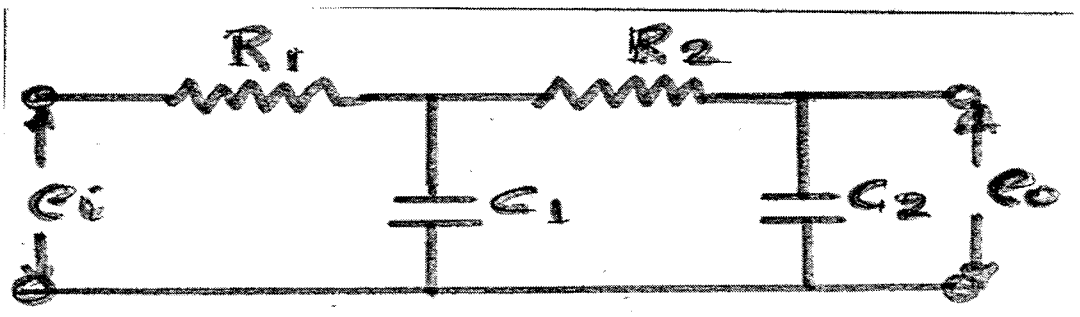

Figure 2

5. a) What is the significance of using block diagrams?

b) Reduce the block diagram as shown in the figure 3 below and find the transfer function.

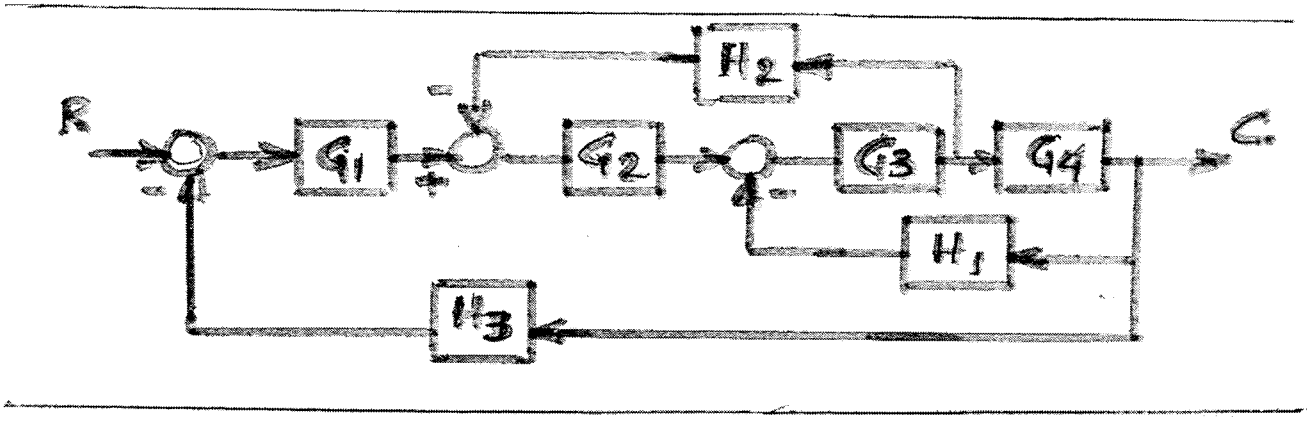

Figure 3

OR

6. For the signal flow graph as shown in the figure 4 below, find the transfer function (C/R). Later in the transfer function taking $G_3 = G_1G_2H_2$ show that $C/R = G_1G_2$.

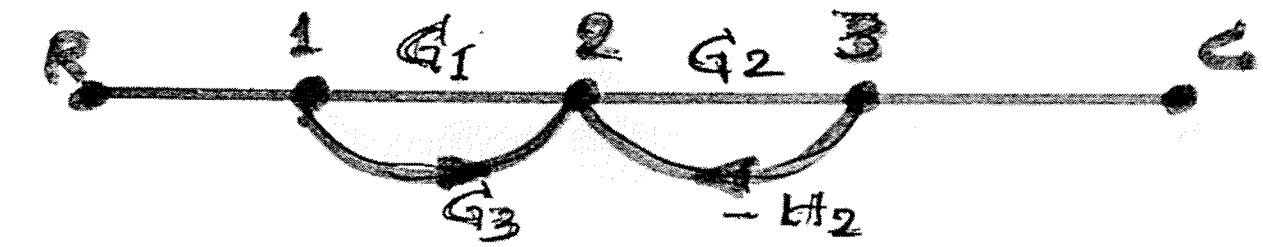

Figure 4

Part C

Answer any **two** Questions. **Each** question carries **fifteen** marks. (2Qx15M=30M)

7.a. Derive an expression for the response of first order system to step input

b. A unity feedback system has a open loop transfer function

$$G(s) = K / S(S+10)$$

Determine the gain K of the system for the damping ratio of 0.5.

OR

8.a. Define how second order systems are classified according to damping ratio?

b. Derive an expression for the II order underdamped system excited by step input.

9.a. State Nyquist stability criterion.

b. Sketch the Nyquist diagram for the system having open loop transfer function

$$G(s)\,H(s) = (S+2) / (S+1)\,(S-1)$$

and hence ascertain the stability of the system.

OR

10. Sketch the Root Locus plot for the system having open loop transfer function

$$G(s)\,H(s) = K / S(S^2+2s+2)$$

Determine for what value of gain K the system becomes stable.