USN

10ME82

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
Control Engineering

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Missing data, if any, may be suitably assumed.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Differentiate open loop control system and closed loop control system with an example. **(07 Marks)**

b. What is control action? Explain any one of its type with an example. **(07 Marks)**

c. What are the requirements of an ideal control system? Explain. **(06 Marks)**

2 a. Obtain the transfer function model of an AC motors in control system. **(07 Marks)**

b. Find the transfer function of a mechanical system shown in Fig.Q2(b) constructing free body diagram.

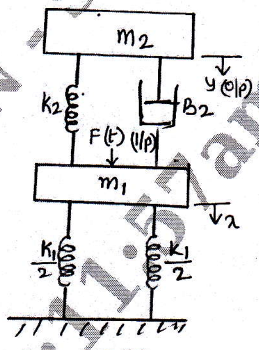

Fig.Q2(b) **(07 Marks)**

c. Obtain the mathematical modeling of a first order pneumatic system. **(06 Marks)**

3 a. Find the transfer function of a block diagram shown in the Fig.Q3(a).

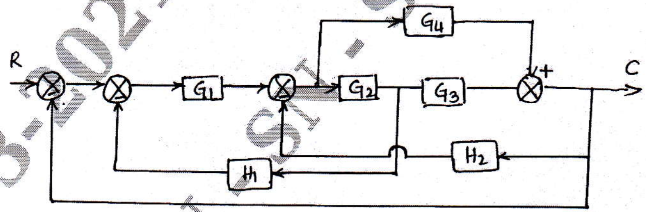

Fig.Q3(a) **(08 Marks)**

b. Using Mason's gain formula find the overall transfer function of a signal flow graph shown in Fig.Q3(b).

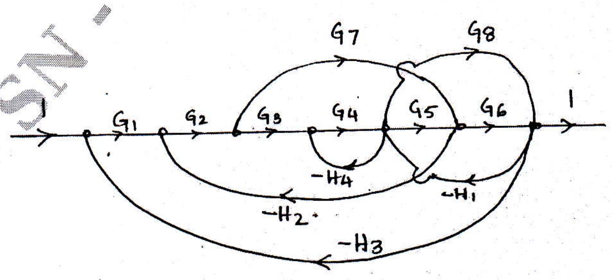

Fig.Q3(b) **(12 Marks)**

4 a. Explain he different types of inputs. (05 Marks)
b. Determine the stability of the system for the following equation using R–H criteria.
$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. (07 Marks)
c. The measurement conducted on a servosystem, which shows the system response as $C(t) = 1 + 0.25e^{-50t} - 1.25e^{-10t}$ when subjected to a unit step input. Obtain the closed loop transfer function also find ωd and ξ. (08 Marks)

PART - B

5 a. Draw the polar plot for $G(s) = \frac{5(s+1)}{s(s+2)}$. (06 Marks)
b. Draw the Nyquist plot and analyse the stability of $G(s) = \frac{4}{s(1+0.1s)(1+0.2s)}$. (14 Marks)

6 a. What is Bode attenuation diagram? Explain. (05 Marks)
b. Draw the Bode magnitude and phase angle plot for $G(s) = \frac{(s+0.2)}{s(s+0.01)(s+2)(s+10)}$.
Find PM, GM and K values. (15 Marks)

7 a. List the general rules for constructing root loci. (05 Marks)
b. Sketch the root locus for the following OLTF $G(s) = \frac{k(s+1)(s+2)}{(s+0.1)(s-1)}$. (15 Marks)

8 a. With a neat sketch explain series and feedback system with an examples. (10 Marks)
b. For the system shown in Fig.Q8(b), write the differential equations for the mass m and obtain the matrix representation of state equations.

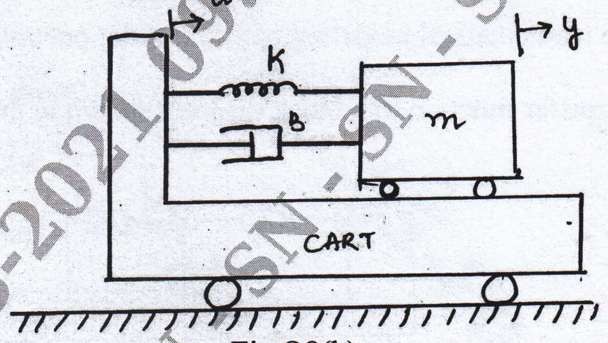

Fig.Q8(b) (10 Marks)

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