CBCS SCHEME

USN | | | | | | | | | | |

18MT34

Third Semester B.E. Degree Examination, July/August 2022
Control Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Compare Open Loop and Closed Loop control system. **(10 Marks)**

b. Explain and generate equations for force voltage and force current analogy. **(10 Marks)**

OR

2 Explain the block diagram reduction techniques or rules with illustration and the basic procedure to solve them. **(20 Marks)**

Module-2

3 a. Define the following terms with respect to signal flow graphs.
i) Source Node
ii) Sink node
iii) Forward path
iv) Feedback loop
v) Loop gain with a Sample SFG diagram. **(10 Marks)**

b. Draw the SFG and hence determine overall transfer function of the block diagram shown in Fig.Q3(b).

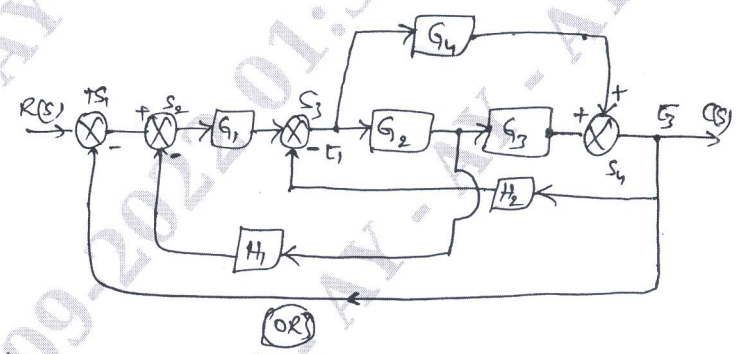

Fig.Q3(b) **(10 Marks)**

OR

4 a. What is a Standard Test Input? What are the 4 types of it? Explain. **(10 Marks)**

b. Prove that output = $(1 - e^{-t/T})$ for a step input in first order system. **(10 Marks)**

Module-3

5 a. What do you mean by stable system and locate the roots on S-plane for the stable, unstable and marginally stable conditions with nature of roots that exist. **(10 Marks)**

b. Check the stability of the system having CE $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. **(10 Marks)**

OR

6 a. $s^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$. Find the number of roots of this equation with the real parts, zero real part and –ve real part. **(10 Marks)**

b. Derive an expression for resonant peak "M_p" for a second order system. **(10 Marks)**

Module-4

7 Sketch Bode plot the transfer function : $G(s) = \frac{ks^2}{(1+0.2s)(1+0.02s)}$. Determine value of 'k' for gain cross over frequency to be 5 rad s^{-1}. **(20 Marks)**

OR

8 Sketch the complete root locus for the system having $G(s)H(s) = \frac{K}{s(s+3)(s^2+3s+11.25)}$. **(20 Marks)**

Module-5

9 a. Define state variable, state vector, state space and state trajectory. **(08 Marks)**

b. Derive transfer function from the state model. **(08 Marks)**

c. What are the applications of state model? **(04 Marks)**

OR

10 a. What are the properties of state transition matrix? **(08 Marks)**

b. A 2^{nd} order system is obtained by $\frac{d^2y}{dt^2} + \frac{2dy}{dt} + 2y(t) = u(t)$. Obtain the state transition matrix. **(12 Marks)**

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