U.S.N ☐☐☐☐☐☐☐☐☐☐

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Seventh Semester, B.E. - Mechanical Engineering
Semester End Examination; February - 2022
Automatic Control Engineering

Time: 3 hrs   *Max. Marks: 100*

*Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a.	List and explain various types of control systems.	10
b.	Explain the requirements of ideal control system.	10
2 a.	Derive the transfer function for an armature controlled DC motor.	10
b.	Explain the Force-Voltage and Force-Current analogy for translational and rotational mechanical system.	10

UNIT - II

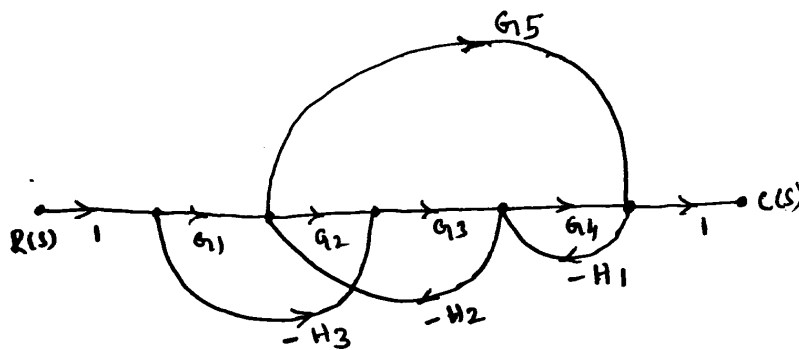|		
3 a.	Explain with neat sketches block diagram reduction techniques.	10
b.	Derive closed loop transfer function, $T.F. = \dfrac{C(S)}{R(S)} = \dfrac{G(S)}{1 \pm G(S)H(S)}$.	10
4 a.	Explain Mason's gain formula and any five terminologies used in signal flow graph.	10
b.	Obtain the overall transfer function $\dfrac{C}{R}$ for the signal flow graph shown in Fig. 4 (b).	10

Fig 4 (b).

UNIT - III

5 a.	With the help of neat sketch, explain the various time response specifications.	10
b.	Discuss the time response of first order system to step input signal.	10
6 a.	Explain the various types of error constants for different test signals.	10
b.	$G(S) = \dfrac{K}{S(S+6)(S+8)}$ and $H(S) = S+26.$ Comment on stability.	10

UNIT - IV

7 a. Explain Nyquist stability criterion. 4

 b. Draw Bode plot for unity feedback system given by, $G(S)H(S) = \dfrac{10}{S(1+0.25)}$. 16

8 a. Define the terms; gain margin and phase margin. 4

 b. Sketch the rough nature of polar plot for system,

$$G(S)H(S) = \dfrac{10}{S(S+1)(S+2)}.$$
16

UNIT - V

9 a. Explain the procedure for construction of root locus plot. 10

 b. Explain controllability and observability for single input single output system. 10

10 a. Define root locus. 2

 b. Construct root locus for $\dfrac{K}{S(S^2 +8S +15)}$ and comment on stability. 18

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