U.S.N

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Fifth Semester, B.E. - Industrial and Production Engineering
Semester End Examination, Dec. - 2014
Control Engineering and Machine Tool Drives

Time: 3 hrs *Max. Marks: 100*

*Note: Answer any **FIVE** full questions, selecting at least **TWO** full questions from each part.*

PART - A

1.a. Explain a closed loop control system with the help of a block diagram. 8

  b. Explain the requirement from an ideal control system. 6

  c. What are the advantages of a closed loop system over open loop system? 6

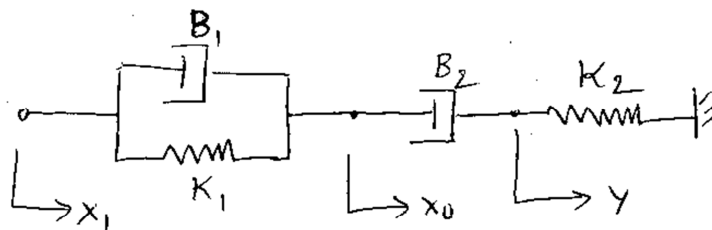2 a. Obtain the transfer function $\dfrac{X_0(S)}{X_1(S)}$ for mechanical system shown in Fig. 2(a). 12

Fig Q. 2(a)

  b. Develop the differential equation relating the input q_1 with the response h_2 for the liquid level system shown in Fig. 2 (b) 8
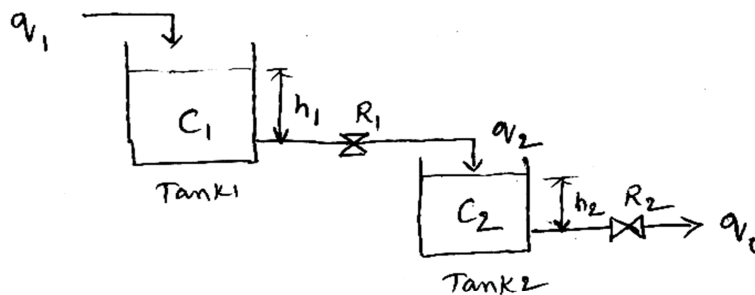

Fig Q 2(b)

3 a. Obtain the transient and steady state response for the 1st order electrical system subjected to step input. Also show the input and the response curve. 10

  b. The open loop transfer function of a unity negative feedback system is given by

$h(s) = \dfrac{25}{S(S+5)}$ Obtain % maximum overshoot, peak time, rise time and settling time. 10

4 a. Reduce the block diagram shown in Fig. 4(a) to simple form and determine the control ratio.
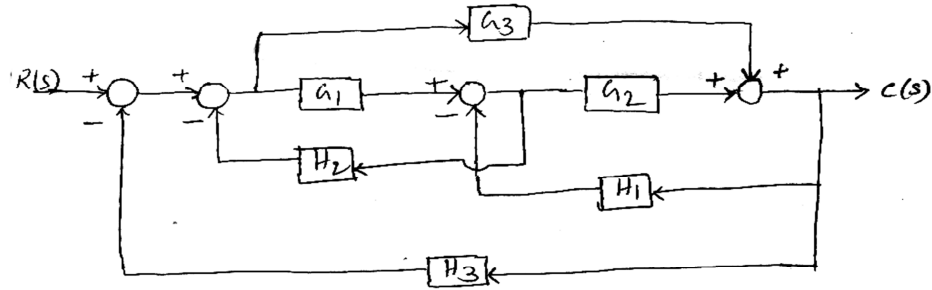

Fig Q.4(a)

10

b. Convert the block diagram shown in Fig 4(a) to signal flow graph and verify the control ratio using Mason's Gain formula.

10

PART - B

5 a. What are the different requirements for the design of machine tool slide way and with a neat sketch explain any three types of slide way shapes?

12

b. Explain the methods for increasing the stiffness and rigidity of machine tool bed.

8

6 a. What is PIV drive? Mention the various advantages of PIV drive.

8

b. What are the advantages of group drive over individual drive?

6

c. Briefly explain electric motors used for machine tool drive.

6

7. Design a speed gear box incorporations support drive with clutch arrangement with 1 x 4 x 3 combination, having minimum speed 31.5 rpm and maximum speed = 1290. Calculate the progression ratio, speed distribution, speed diagram, No. of teeth on each gear. Also design the shaft I and II, Take motor speed = 1400 rpm and HP = 2.

20

8 a. With the help of a neat sketch explain the working principle of a vane pump.

8

b. Explain the classification of hydraulic valves.

6

c. Write a note on adaptive control system.

6

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