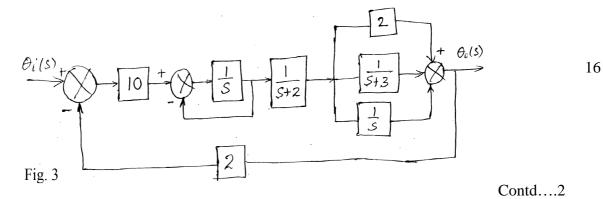
P13ME71 Page No.		1
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Tir	P.E.S. College of Engineering, Mandya - 571 401 (An Autonomous Institution affiliated to VTU, Belgaum) Seventh Semester, B.E Mechanical Engineering Semester End Examination; Dec - 2016/Jan - 2017 Automatic Control Engineering me: 3 hrs Max. Marks:	100
	<i>te</i> : <i>i</i> ) Answer <b>FIVE</b> full questions, selecting <b>ONE</b> full question from each unit.	100
	ii) Assume suitably missing data if any. UNIT - I	
1 a. '	What are the basic requirements of an ideal control system?	5
	With block diagram explain :	
i	i) Regulator system ii) Follow up system.	8
	With suitable sketch explain automatic tank level control system and also identify sy parameter and system components.	vstem 7
2 a. 1	Determine the differential equation of the hydraulic system shown in Fig. 1	
i	i) Relate head of the II tank with inflow of I tank	
i	ii) Relate inflow of the I tank with outflow of II tank.	
	Print Cross Section A, hit	1
b (	Obtain the differential equation for RLC electrical circuit.	

UNIT - II

- 3 a. Write a note on Summing junction.
  - b. Reduce the given block diagram into canonical form shown in Fig.3 and determine closed loop transfer function. Also represent in open loop form.



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4 a. Differentiate between block diagram and signal flow graph.

b. The equations describing the dynamic behavior of a control system are given below:

$$x_{2} = a_{12}x_{1} + a_{32}x_{3} + a_{42}x_{4} + a_{52}x_{5}$$

$$x_{3} = a_{23}x_{2}$$

$$x_{4} = a_{34}x_{3} + a_{44}x_{4}$$

$$x_{5} = a_{35}x_{3} + a_{45}x_{4}$$
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Where  $x_1 \& x_5$  are the input and output? Construct the signal flow graph and find its overall gain.

## UNIT - III

- 5. Obtain an expression for response of a second order mechanical system subjected to a step input for under damped case and also draw the response curve.
- 6 a. The system has characteristic equation  $S^4+3S^3+4S^2+3S+K=0$ . Determine the value of K, so that characteristic equation has two complex conjugate roots with zero real part. Find out 10 those roots by Routh Hurwitz criterion method.
  - b. Write a note on :

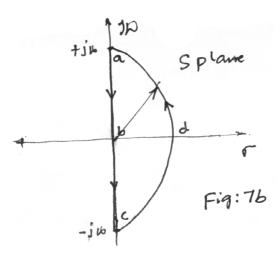
i) Static velocity error constant ii) Static acceleration error constant.

#### UNIT - IV

7 a. What are polar plots? Sketch the polar plot of the system having open loop transfer function,

$$G(S)H(S) = \frac{10S}{(1+4S)}$$

b. Obtain the Nyquist diagram for the system shown in Fig. 7b and ascertain its stability and its open loop transfer function is  $G(S)H(S) = \frac{100}{(1+2S)}$ 



8. Construct the Bode plot on a semi log graph paper for a unity feedback system, whose open loop transfer function is given by  $G(S)H(S) = \frac{10}{S(1+S)(1+0.02S)}$ .

Contd....3

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From the Bode plot determine;

- a) Gain and phase cross over frequencies
- b) Gain and phase margin
- c) Stability of the closed loop system.

## UNIT - V

9. Draw the complete root locus plot for the system with open loop transfer function

$$G(S)H(S) = \frac{K}{S(S^2 + 4S + 7)}$$
. Hence determine the range of values of K over which the 20

system remain stable and what is the range of damping factor for the dominant poles?

- 10. Write note on :
  - a) System state and state variable
  - b) Transformation matrix.