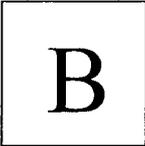


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***B.Tech. Degree VIII Semester Examination in  
Marine Engineering July 2014***

**MRE 804 MARINE CONTROL ENGINEERING AND AUTOMATION  
(2006 Scheme)**

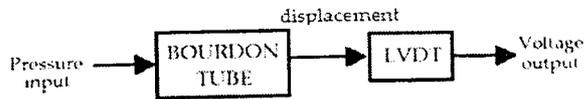
Time: 3 Hours

Maximum Marks: 100

- I. (a) Explain with a neat sketch the principle and working of variable area – constant pressure flow meter and constant area – variable pressure flow meter for measurement of liquid flow rate. Also explain air flow meter. (12)
- (b) Explain the working of flapper nozzle with the help of a neat diagram. Explain its implementation in electro-pneumatic signal converter. (8)

**OR**

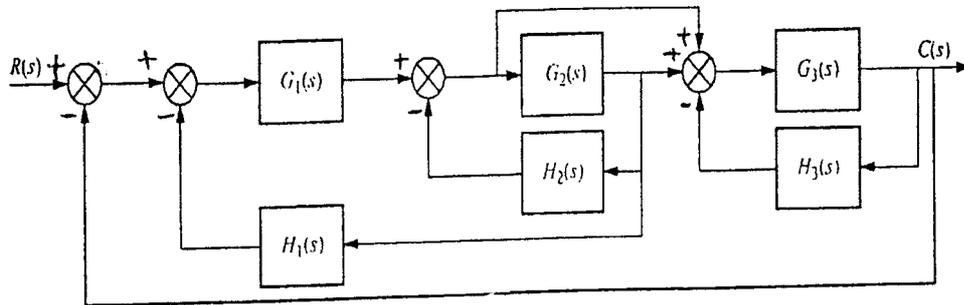
- II. (a) Differentiate primary and secondary transducer. With relevant diagrams design a system from the figure so that bourdon tube acts as primary transducer and LVDT acts as a secondary transducer. (7)



- (b) With the help of a suitable diagram explain the following:
  - (i) Oil mist detector (4)
  - (ii) pH sensors (4)
  - (iii) Synchros (5)
- III. (a) What do you mean by automatic control system? List its advantages. (6)
- (b) Explain the role of proportional, integral and derivative controller to make the system stable. Also explain the working of an electronic P-I system. (14)

**OR**

- IV. (a) Explain process control. What are the various elements of process control? Using a suitable example explain all the standard terms related to process control. (12)
- (b) Differentiate ON-OFF and modulating controller. Also explain different types of lags associated with system response. (8)
- V. (a) Reduce the block diagram and find the transfer function  $C(s)/R(s)$ . (12)

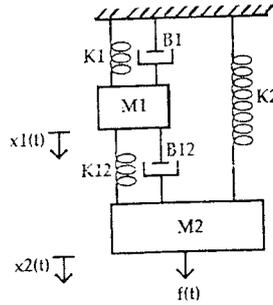


- (b) For a unity feedback system having open loop transfer function  $\frac{k(s+2)}{s^2(s^2+7s+12)}$  determine (8)
  - the type of the system, error constants and range of k for which steady state error due to parabolic input less than 0.1.

**OR**

**(P.T.O.)**

- VI. (a) Write the differential equations governing the mechanical system shown in figure and find the transfer function: (10)

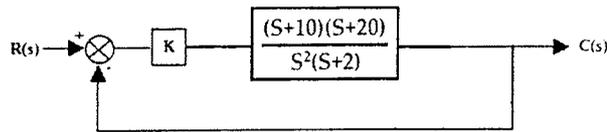


- (b) A system is described by  $3\frac{dy(t)}{dt} + 2y(t) = 7x(t)$ . Determine the response of the system with impulse input and unit step input. Plot the response curve. (10)

- VII. Explain Nyquist stability criterion. Sketch the Nyquist contour whose open loop transfer function is given by  $G(s)H(s) = \frac{k}{s(s+2)(s+10)}$ . Find the range of k for stability. Comment on the stability of the system. (20)

OR

- VIII. From the figure:



- (i) Find closed loop transfer function. (3)
- (ii) Find the range of k for stability. (7)
- (iii) If the system oscillates find the frequency of oscillation. (2)
- (iv) Explain Routh Hurwitz criterion for stability. Define critical point and explain the role of critical point to find the stability. (8)

- IX. (a) Describe system used for feed water control two and three element type with a neat sketch. (10)
- (b) Sketch and describe control system used for automatic combustion control in marine boiler. (10)

OR

- X. (a) Discuss the instrumentation requirements for a UMS class vessel. (10)
- (b) Sketch and describe a system used for cooling water temperature control of a main machinery unit. (10)

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