B. Tech Degree VIII Semester Examination in Marine Engineering, December 2007

MRE 804 MARINE CONTROL ENGINEERING AND AUTOMATION

Time : 3 Hours   Maximum Marks : 100

I. (a) Describe with the aid of a suitable diagram the constructional details and working principle of oil mist detector.   (12)
    (b) Discuss the importance of oil mist detector.   (8)

OR

II. (a) What is a transducer? Illustrate the functioning of an Electro-pneumatic transducer.   (10)
    (b) Sketch and describe how a flapper-nozzle device controls the pneumatic pressure in an air line.   (10)

III. Explain **_any four_** of the following terms with the help of suitable diagrams :
    (i)   Open loop control system   (ii)   Derivative action controllers
    (iii) Desired Value and Set Value   (iv)   Off – Set
    (v)   Reset action   (vi)   Fail Safe.   (4 x 5 = 20)

OR

IV. Explain functioning of a proportional controller.   (10)
    What is the effect of adding Integral and Derivative function to it?   (10)

V. (a) Discuss the functioning of an Electro-hydraulic Actuator. Suggest where this kind of actuator is used on board a ship.   (10)
    (b) Figure – 1 shows a gas pressure system.
            Volume of the vessel = 1.2 m^3
            Gas temperature = 257°C
            Gas resistance R_t = 1.8 x 10^5 NS/Kgm^2
        Find the transfer function of the system relating 'p' and 'm', 'p' being the pressure in the vessel and 'm', the inflow mass flow rate.
   Gas constant R = 297 = J/Kgk.
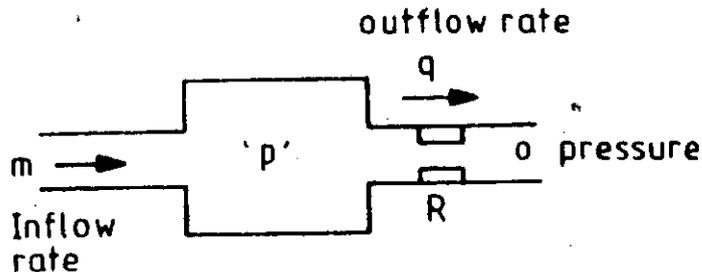
(Figure – 1)   (10)

OR

VI. (a) Sketch and describe the functioning of a Diaphragm Actuator.   (10)

  (b) Sketch and describe the functioning of a valve positioner. What are the advantages of using of a valve positioner?   (10)

VII. (a) Explain Routh's stability Criteria.   (8)

  (b) For the control system given in Figure – 2 find the range of values of Ki for the system to be stable.

$$\frac{5(1+0.4D+0.8K_i)}{D}$$

$$\frac{1}{8D^2+2D}$$
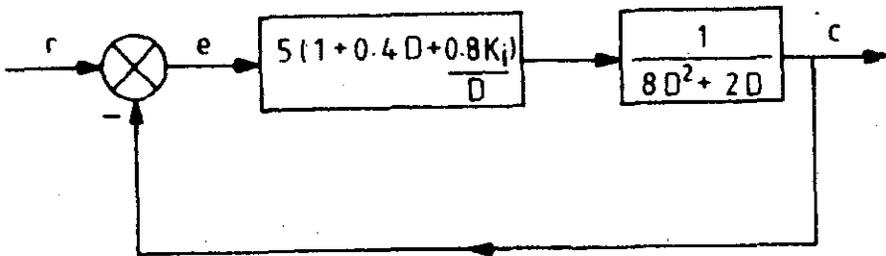
(Figure – 2)   (12)

OR

VIII. (a) Explain Nyquist stability criteria.   (8)

  (b) Draw the Nyquist diagram for the control system, with the block diagram given in Figure – 3.

$$\frac{1}{s(s+1)}$$
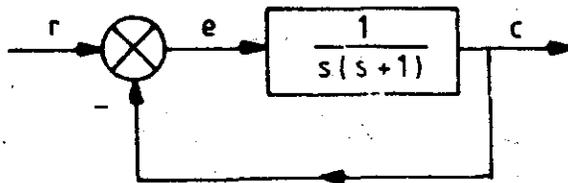
(Figure – 3)   (12)

IX. (a) Sketch and describe a system used for cooling water temperature control of a main machinery unit.   (10)

  (b) What should be the 'Fail Safe' arrangement for the above system? Discuss if the Control valve can be 'NO' or 'NC' Type.   (10)

OR

X. (a) With the help of a block diagram explain the process of starting of a direct reversing Diesel Engine with Bridge Control. What are the starting interlocks usually provided?   (10)

  (b) Discuss the instrumentation requirements for a UMS class vessel.   (10)

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