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**B.Tech. Degree VIII Semester Examination in
Marine Engineering July 2017**

**MRE 1804 MARINE CONTROL ENGINEERING AND AUTOMATION
(2013 Scheme)**

Time : 3 Hours

Maximum Marks : 100

(5 × 20 = 100)

- I. (a) Explain any two level measuring devices with neat diagram. (6)
 (b) Explain viscosity sensor with suitable sketch. (6)
 (c) Explain the following with the aid of suitable diagram. (8)
 (i) Bonded Strain Gauge.
 (ii) Photo electric cells.

OR

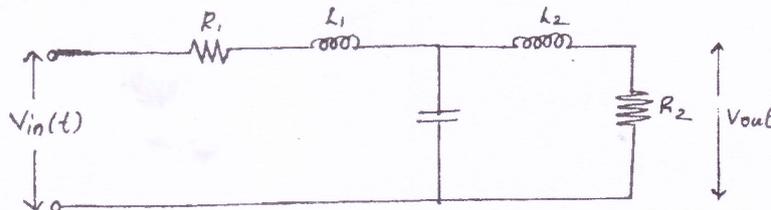
- II. (a) Explain electro pneumatic signal converter with neat sketch. (7)
 (b) Explain Synchros with neat diagram. (7)
 (c) Explain variable inductance transducer. (6)

- III. (a) Explain the following. (15)
 (i) On-off control.
 (ii) Split range control.
 (iii) Cascade control.
 (b) Explain distance velocity, measurement and transfer lags. (5)

OR

- IV. (a) Explain the functions of a proportional, integral and derivative action controllers. (12)
 (b) Explain the term feed back with respect to control system. Differentiate open loop and closed loop control systems. (8)

- V. (a) A system is described by transfer function $G(s) = \frac{100}{s^2 + 125s + 100}$. Find the unit impulse response of the system. (10)
 (b) Model the following electrical system and find the transfer function. (10)



OR

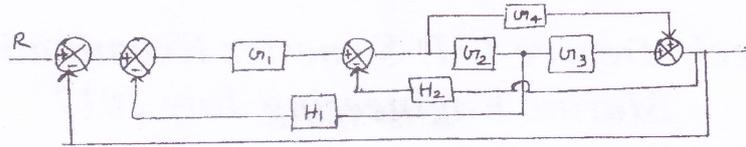
- VI. (a) A feedback control system characterized by transfer function $G(s) = \frac{k}{s^2 + 2s + k}$. (10)

Determine:

- (i) Gain K so that the system will have a damping ratio = 0.3.
 (ii) For this value of K find rise time, peak time, settling time and peak overshoot.

(P.T.O.)

- (b) Reduce the block diagram and find the overall transfer function. (10)



- VII. (a) For a unity feedback system open loop transfer function is $\frac{k(s+5)}{s(s+0.1)(s+3)}$. (12)

Determine:

- (i) Steady error constant.
 - (ii) Steady state error for unit ramp input.
 - (iii) Range of K for which steady state error due to ramp input is less than 0.1.
- (b) Using Routh Hurwitz criteria find the location of roots on s plane and hence the stability of the system with characteristic polynomial $s^6 + s^5 + 3s^4 + 3s^3 + 3s^2 + 2s + 1 = 0$. (8)

OR

- VIII. (a) Construct the Nyquist plot for a system whose open loop transfer function of a system is $G(s)H(s) = \frac{k(1+s)^2}{s^3}$. Find the range of K for stability. (12)
- (b) Explain the time domain specifications. (8)

- IX. (a) Explain the instrumentation requirements for a UMS class vessel. (10)
- (b) Explain automatic combustion control system of marine boilers. (10)

OR

- X. (a) Explain the control system in main machinery units for temperature of lubricating oil. (10)
- (b) Explain the feed water control system in marine boiler. (10)
