COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

B.TECH. DEGREE VIII SEMESTER EXAMINATION IN MARINE ENGINEERING JULY 2020

MRE 1804 MARINE CONTROL ENGINEERING AND AUTOMATION

(*2013 Scheme*)

Time: 3 hrs [36 Minutes for Answering and Scanning/Uploading the page of the Answer Sheet per module]

Max. Marks: 20 per module

INSTRUCTIONS

1. You have to answer only one question per module.
2. Answer may not exceed one page of an A4 size paper in a standard handwriting, as far as possible.
3. If at all an answer goes beyond one page, (due to your handwriting) another page can also be used. In such a situation, the page number should be given as 1/2, 2/2.
4. You have to put dated signature along with Register Number, Subject Code, Module/Group Number (as given in the Question Paper) in each page.
5. You have to put the Question Number correctly.
6. After answering the question, you have to scan and upload the answer page.

MODULE - I

(Answer ***ANY ONE*** question)

I(1). With a neat sketch write the working of the following: (20)

(i) Device which helps the engine to detect the level of oil mist in the crankcase.

(ii) Device used to measure viscosity of the marine fuel oil.

OR

I(2). Explain Flapper-nozzle mechanism and Synchros as signal transmitting device using a neat sketch. (20)

MODULE - II

(Answer ***ANY ONE*** question)

II(1). What is proportional control system? State its advantages and disadvantages. What is the need of adding integral and derivative controller with proportional controller? Explain with an example. (20)

OR

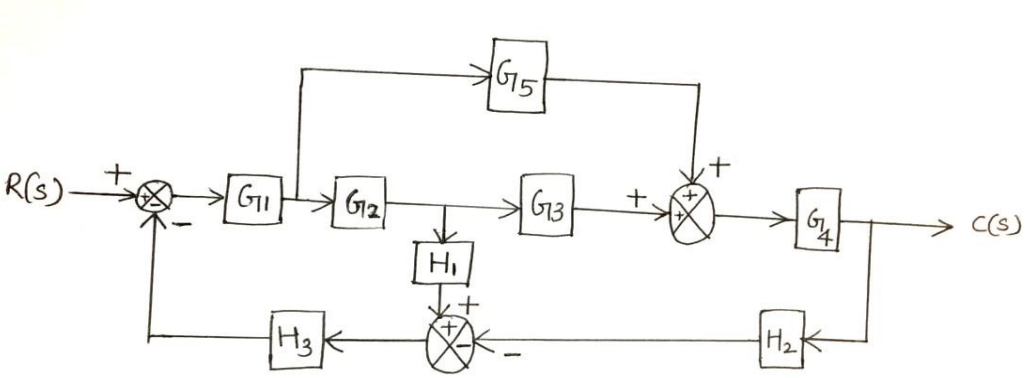
II(2). (a) Differentiate Process variable, Measured variable and Manipulated variable using a suitable example. (8)

(b) What is cascade control? Explain with a neat sketch a cascade control system. (12)

MODULE - III

(Answer ***ANY ONE*** question)

III(1). Reduce the block diagram and find the transfer function C(s)/R(s). (20)



OR

III(2). (a) For a unity feedback system with open loop transfer function $\frac{10}{s(s+5)}$, find the Closed Loop Transfer Function, Rise time, Peak overshoot and Settling time for error of 8%. (10)

(b) For a unity feedback system with open loop transfer function $\frac{k(s+2)}{s^2(s^2+7s+12)}$, determine the type of the system, error constants, steady state errors and range of k for which steady state error due to parabolic input less than 0.1. (10)

MODULE - IV

(Answer ***ANY ONE*** question)

IV(1). The open loop transfer function of a unity feedback control system is given by $G(s)=\frac{Ke^{-0.1s}}{s(1+0.1s)(1+s)}$. Determine: (20)

(i) The value of K so that phase margin is 60 degree.

(ii) For the given system if the gain cross over frequency is doubled find the new phase margin.

OR

IV(2). (a) A unity negative feedback control system has open loop transfer function $\frac{K(s+2)}{\left(s^3+As^2+3s+2\right)}$. Determine the critical value of K and A, using Routh Hurwitz method where K and A are positive constants so that the system oscillates with a frequency of 5 rad/sec. (13)

(b) The characteristic polynomial of a unity feedback control system is given by $F(s)=s^2+Ts+K$. Using Routh Hurwitz method determine the value of T and K such that all the roots of $F(s)$ are in LHP (left half of s plane) of the vertical line passing through $s=-a$. (7)

MODULE - V

(Answer ***ANY ONE*** question)

V(1). With a neat sketch describe system used for feed water control two and three element type in marine Boiler. (20)

OR

V(2). (a) Discuss the instrumentation requirements for a UMS class vessel. (10)

(b) Sketch and describe a system used for Jacket cooling water temperature of the main machinery unit. (10)

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