B.Tech. Degree VIII Semester Supplementary Examination in Marine Engineering June 2024

MRE 1804 MARINE CONTROL ENGINEERING AND AUTOMATION
(2013 Scheme)

Time: 3 Hours   Maximum Marks: 100

(Answer *ALL* questions)

(5 × 20 = 100)

I.   (a)   Elaborate on the various types of elastic pressure transducers which can be used for high pressure measurement.   (10)
     (b)   Write short notes on: (10)
           (i)   Variable inductance and capacitance transducers
           (ii)   Force balance transducers.

OR

II. (a)   Describe any one contactless technique each employed for temperature measurement and level measurement.   (10)
     (b)   Discuss the principle of operation of the following instruments.   (10)
           (i)   Bonded and unbounded strain gauges
           (ii)   Mechanical tachometers.

III. (a)   Explain the various modulating control techniques employed in automatic control systems.   (10)
     (b)   Discuss how the various control actions are generated in stacked type controllers.   (10)

OR

IV. (a)   Describe the following in detail: (10)
           (i)   ON-OFF control
           (ii)   Split range control
           (iii) Relays.
     (b)   Discuss the various electronic and pulse type automatic controllers.   (10)

V.   (a)   Derive the transfer function of an armature controlled DC motor.   (10)
     (b)   Obtain the transfer function C/R using block diagram reduction technique.   (10)
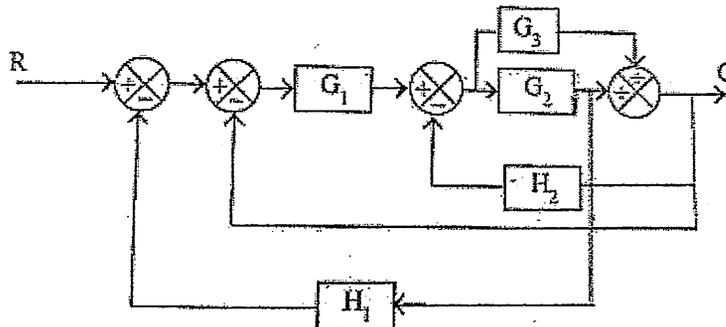
OR

VI. (a)   Obtain the transfer function of a liquid level system.   (10)
     (b)   Obtain the response of a unity feedback system whose open loop transfer function is $G(s) = 4 / s(s + 5)$ when the input is unit step.   (10)

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VII.	(a)	State Nyquist stability criterion. Based on the encirclements of the point -1+j0 discuss the three conditions of unstability of a control system.	(5)
	(b)	Construct the Nyquist plot for a system whose open loop transfer function is given by $G(s) H(s) = K (1 + s)^2 / s^3$. Find the range of K for stability.	(15)

OR

VIII.	(a)	Determine the range of 'K' for stability of unity feedback system whose open loop transfer function is $G(s) = K / s(s + 1)(s + 2)$.	(10)
	(b)	For the open loop transfer functions given below, identify the type of input signal which generates constant steady state error and calculate their values	(10)
		(i) $G(s) = 20(s+2) / s(s+1)(s+3)$	
		(ii) $G(s) = 10 / (s +2)(s+3)$.	

IX.	(a)	Explain the steam pressure control and combustion chamber pressure control systems in marine boilers.	(10)
	(b)	Explain the two element and three element type feed water control technique implemented in marine applications.	(10)

OR

X.	(a)	Explain how fuel oil temperature control and viscosity control is achieved in marine boilers.	(10)
	(b)	Discuss the various instrument requirement for UMS classification.	(10)

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