

Model Question Paper-1/2 with effect from 2022-23 (CBCS Scheme)

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Fourth Semester B.E. Degree Examination Subject Title : Process Control & IIoT

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Discuss Static and Dynamic characteristics in detail.	L2	4
	b	Explain with a neat sketch, the construction, operation, static and dynamic characteristics of Thermocouples. Give its advantages, disadvantages and applications.	L2	8
	c	Explain with a neat sketch, the construction, operation, static and dynamic characteristics of a Bourdon–pressure gauge. Give its advantages, disadvantages and applications.	L2	8
OR				
Q.02	a	Elaborate with a neat sketch, the construction, operation, static and dynamic characteristics of a diaphragm pressure gauge. Give its advantages, disadvantages and applications.	L2	10
	b	Describe with a neat sketch, the construction, operation, static and dynamic characteristics of an optical pyrometer. Give its advantages, disadvantages and applications.	L2	10
Module-2				
Q. 03	a	Derive the transfer function model for mercury thermometer and plot the response curve for step, impulse forcing function.	L2	8
	b	A thermometer is observed to exhibit the first order dynamics is having time constant of 6 second is placed in a bath. The bath is subjected to the impulse change of magnitude 3 °C. The steady state temperature indicated by the thermometer is 30 °C. Calculate the temperature indicated by the thermometer at t=3 sec, t=6 sec and t=18 sec.	L3	8
	c	Explain the terms for under damped condition i)Overshoot ii)Rise time iii)Period of Oscillation iv) Ultimate value of response.	L2	4
OR				
Q.04	a	Derive an equation to obtain response for step input in a second order system with under damped condition.	L2	10
	b	Explain under damped condition. A step change of magnitude 4 is introduced in to a system having transfer function $Y(s)/X(s) = 10/ s^2 + 1.6s + 4$ Determine i)Overshoot ii)Rise time iii)Period of Oscillation iv) Ultimate value of response.	L3	10
Module-3				
Q. 05	a	Derive transfer function for proportional integral controller and obtain response for unit step change in error.	L2	12
	b	Determine the transfer functions C/R, C / U1, and B / U2 for the system shown in Fig. Also determine an expression for C in terms of R and U1for the situation when both set point change and load change occur simultaneously.	L3	8

		OR		
Q. 06	a	Explain in detail the construction, working of pneumatic control valve.	L2	10
	b	Discuss different controllers in process control with transfer function.	L2	10
		Module-4		
Q. 07	a	<p>A control system has the following transfer functions. Find the characteristic equation and its roots, and determine whether the system is stable.</p> $G_1 = 10 \frac{0.5s + 1}{s} \quad (\text{PI controller})$ $G_2 = \frac{1}{2s + 1} \quad (\text{stirred tank})$ $H = 1 \quad (\text{measuring element without lag})$	L3	8
	b	Draw the root locus diagram for for the open loop transfer function $K/S(S+4) (S^2 + 2S+2)$	L3	12
		OR		
Q. 08	a	Write a note on Cohen-coon controller and Zeigler Nichols controller tuning.	L2	10
	b	Plot Bode diagram for system whose overall transfer function is $1/(S+1)(S+5)$.	L3	10
		Module-5		
Q. 09	a	Explain how IIoT technology enhances real-time monitoring and control in chemical processes. Provide examples of sensor applications and their role in optimizing process conditions	L2	10
	b	Discuss the challenges and considerations associated with implementing IIoT-enabled process control and instrumentation systems in chemical plants. How can organizations address cybersecurity risks, interoperability issues, and workforce training needs to maximize the benefits of IIoT technology?	L2	10
		OR		
Q. 10	a	Explain the role of Industrial IoT (IIoT) in enabling connectivity, data exchange, and real-time monitoring in smart factories. Provide examples of IIoT applications in manufacturing processes	L2	10
	b	Describe the components and functionalities of a real-time dashboard for data monitoring in an IIoT-enabled environment. What are the key considerations for designing and implementing effective real-time dashboards for industrial applications?	L2	10

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.