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18BT61

Sixth Semester B.E. Degree Examination, July/August 2022 Process Control and Automation

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat diagram explain any two flow measuring instruments. (10 Marks)
b. Explain in detail about online and offline biomass estimation. (10 Marks)

OR

- 2 a. Briefly explain the principle and instrumentation of flow injection analysis. (10 Marks)
b. With a neat diagram explain any two temperature measuring instruments. (10 Marks)

Module-2

- 3 a. Derive the step response and impulse response equation for two tank non interacting system. (10 Marks)
b. Derive the transfer function for liquid level in tank with constant flow outlet. (10 Marks)

OR

- 4 a. Derive the transfer function for two tank non interacting system. (10 Marks)
b. Derive the transfer function for mercury in glass thermometers and derive the response equation for step input. (10 Marks)

Module-3

- 5 a. Derive the transfer function for U-tube manometer which follows the second order system and state all assumptions. (10 Marks)
b. Derive a step response equation for second order system. (10 Marks)

OR

- 6 a. Discuss in detail about the terms used to describe an underdamped system. (12 Marks)
b. A mercury manometers is used to measure the pressure drop orifice meter. A maximum pressure differential such that a liquid column length of 76.2cm is sufficient, specific gravity of mercury is 13.6 and viscosity 1.6 centipods. Find the diameter of the glass tube required for the manometers. (08 Marks)

Module-4

- 7 a. Explain with equations the principle of PI and PID controllers and derive their transfer functions. (10 Marks)
b. Derive the transfer function for servo problem with a neat block diagram. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Derive the transfer function for the following block diagram.

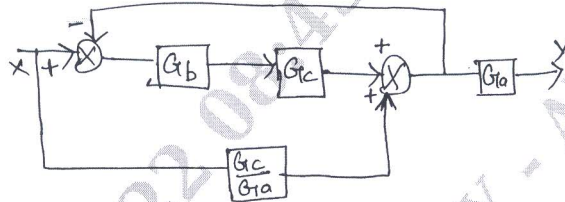


Fig. Q8(a)

(10 Marks)

- b. Write short notes on the following :

- i) Actuators
- ii) Positioners.

(10 Marks)

Module-5

- 9 a. Plot the root locus diagram for the open loop transfer function :
 $G = [K/(S + 1)(S + 2)(S + 3)]$. (10 Marks)
- b. Plot a bode diagram for a system whose overall transfer function is $10/(S + 1)(S + 5)$. (10 Marks)

OR

- 10 a. For the control system described by the following characteristic equation check the number of roots having positive real parts $s^4 + 3s^3 + 5s^2 + 4s + 2 = 0$. (10 Marks)
- b. The characteristic equation of a control system is given by $\frac{1 + K_C}{S(s + 1)(s + 2)(s + 3)}$. Determine the value of K_C for which the system is stable. (10 Marks)
