53 (IE 605) PRIN

2018

PROCESS INSTRUMENTATION AND CONTROL

Paper : IE 605

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* Explain the functional element of an instrumentation measurement system with a suitable example. 10

   (b) What are the dynamic characteristics of an instrument and give its examples? 10

2. *(a)* Distinguish between RTD and Thermistor. Discuss its advantages and disadvantages. 8

   (b) Explain the construction and operation of capacitive pressure gauge, plunger type level measurement and rotameter with neat sketch. 12

Contd.

3. The P&ID diagram is below. Identify the symbols and explain the process operation. 20

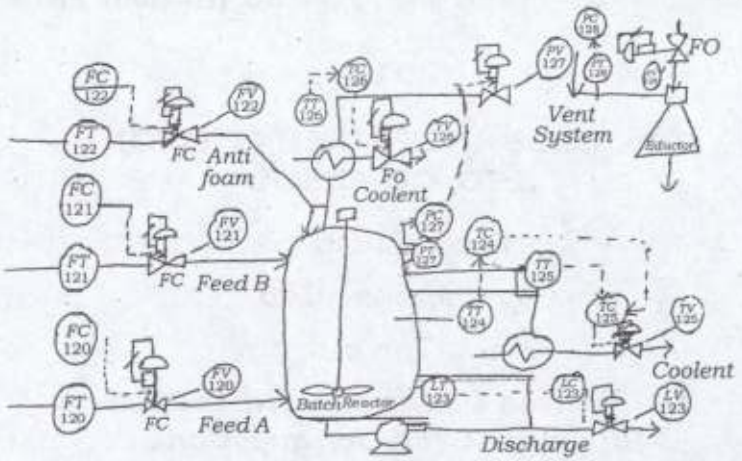

Figure 1

4. *(a)* For the 2-tank system shown in below *figure 2*, find the transfer function $H_1(S)/Q(s)$. 8

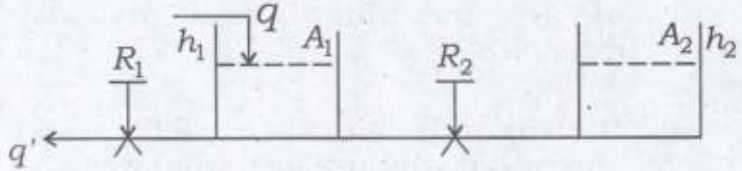

Figure 2

Given $A_1 = 1.5m_2$, $A_2 = 2m_2$,

$R_1 = 16min/m_2j$, $R_2 = 24min/m_2$

(b) Derive the transfer function for the given below system. *(figure 3)* 12

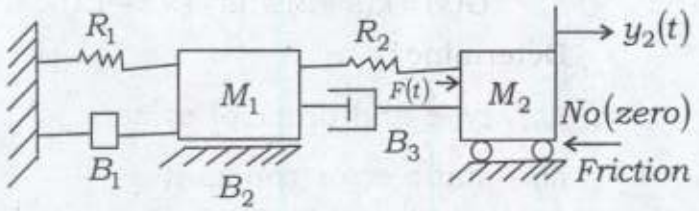

Figure 3

5. *(a)* Derive the transfer function of a block diagram (*figure* given below) using block diagram reduction technique and signal flow graph method. 10

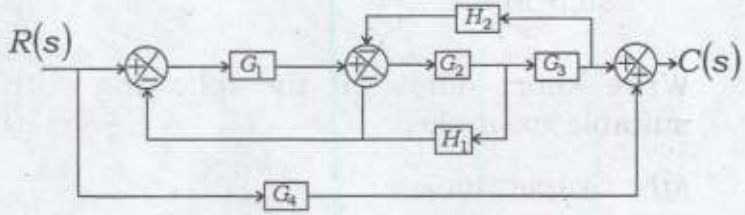

Figure 4

(b) Consider the unity feedback closed loop system where the forward transfer function is $20/s(s+4)$. Obtain the rise time, peak time, maximum overshoot and settling time when the system is subjected to a unit step input. 10

6. *(a)* For unity feedback system having open loop transfer function as

$$G(s) = k(s+2)\,s^2\left(s^2+7s+12\right)$$

Determine :

(i) type and order of system

(ii) static error constants

(iii) steady state error for unit step, unit ramp and unit parabolic inputs with comment on results. 10

(b) Derive the time response of second order under damped system with unit step input. 10

7. Write short notes on the following with suitable example : 4×5=20

(a) Evaporator

(b) Mixing

(c) Heat exchanger

(d) Distillation.
