BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VII**
BRANCH: CHEMICAL ENGG./CEP&P **SESSION : MO/2018**

SUBJECT : CL7001 PROCESS CONTROL AND INSTRUMENTATION

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) With neat sketch discuss the level measurement technique Capacitance type. [2]

(b) A horizontal venturimeter with inlet diameter 30 cm and throat diameter10 cm is used to measure the flow of water. The pressure at inlet is 13.734 N/cm^2 and the vacuum pressure at the throat is 37 cm of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and throat. Also find the value of C_d for the venturimeter. [3]

Q2 (a) What are the different types of pressure measuring device? Derive an expression for U-tube manometers for measuring pressure. [3]

(b) Explain the principle of thermocouple and radiation pyrometer. [2]

Q3 (a) A thermometer having a time constant of 0.1 min is at a steady state temperature of 90°F At time t = 0, the thermometer is placed in a temperature bath maintained at 100°F. Determine the time needed for the thermometer to read 98°F. [2]

(b) Find the transfer function for liquid level system shown in figure 1. Where q_0 is constant [3]

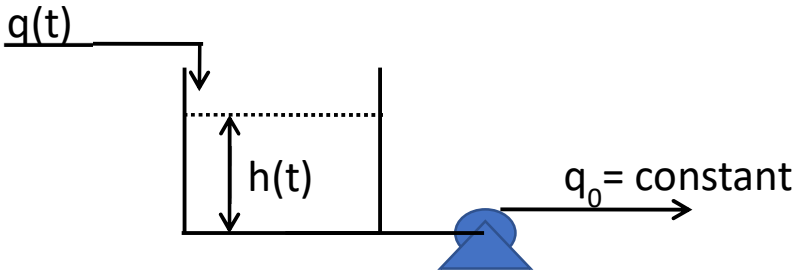

Figure 1

Q4 Find out the transfer function for interacting system shown in figure 2 [5]

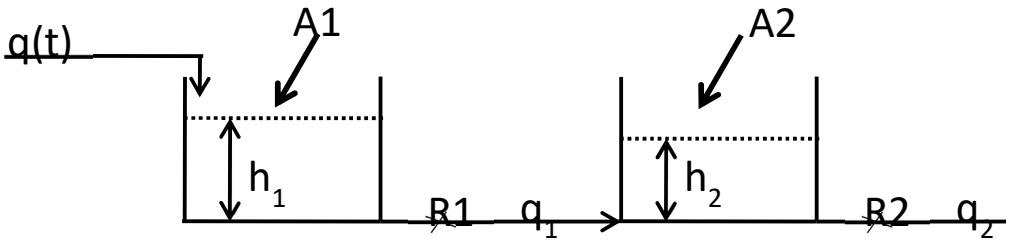

Figure 2

Q5 (a) With neat sketch and mathematical expressions define period of oscillation and decay ratio. [2]

(b) Define proportional band and develop the transfer function for P and PID controller. [3]

PTO

Q6 (a) Determine the transfer function C/R for the system shown in figure 3 [3]

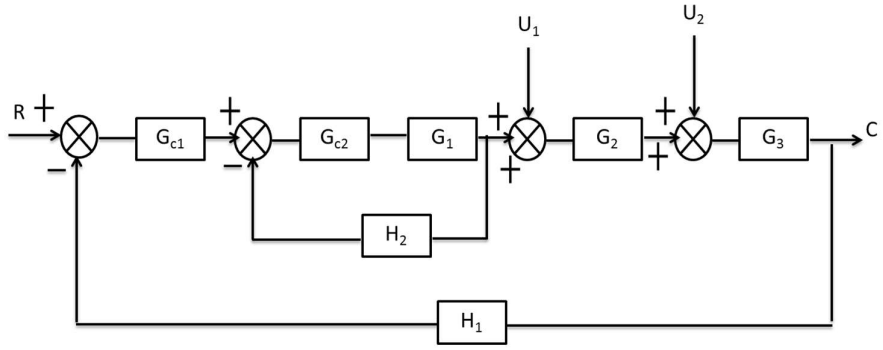

Figure 3

(b) Determine the transfer function C/R, C/U_1 and B/U_2 for the system shown in figure 4 [2]

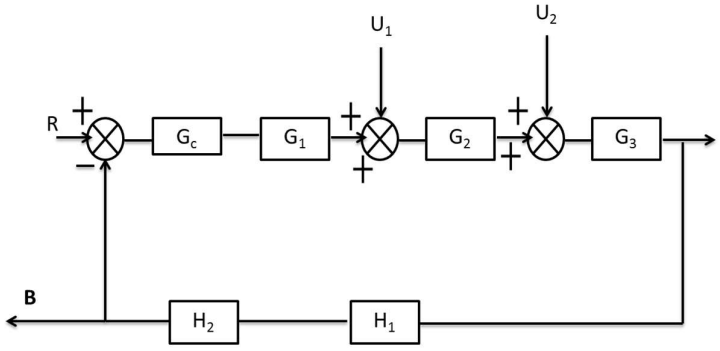

Figure 4

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