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Total Number of Pages: 02

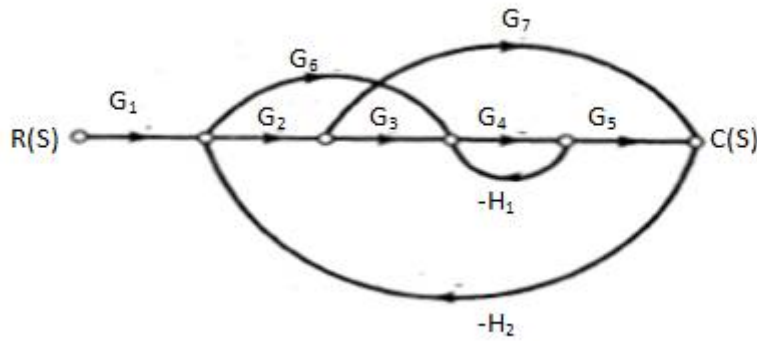
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**M.TECH
P2ARBC02**

**2nd Semester Regular Examination 2016-17
Mechanical Measurement & Control System
BRANCH: AUTOMATION & ROBOTICS
Time: 3 Hours
Max Marks: 100
Q.CODE: Z495**

**Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.**

- Q1** Answer the following questions: *Short answer type* **(2 x 10)**
- a) What do you mean by open loop system and closed loop system? Explain briefly.
 - b) Why Pitot tube is used for measurement. Explain.
 - c) What is Servo control System? How it is helpful in a Measuring Device.
 - d) What are the dynamic characteristics of pressure measuring systems?
 - e) Discuss any two transducers of displacement measurement with their advantages and applications.
 - f) Define gauge factor. Derive the equation for gauge factor.
 - g) What do you understand by Direct and Indirect methods of measurements?
 - h) Differentiate between precision and accuracy
 - i) Explain about Microprocessor -Based Instrumentation.
 - j) What is an error? Give the classification of the errors and describe them in brief.
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- Q2** a) Explain about the functional elements of a measuring system with neat sketch. **(10)**
- b) A single strain gauge having resistance of 120Ω is mounted on a steel cantilever beam at a distance of 0.15 m from the free end. An unknown force F applied at the free end produces a deflection of 12.7 mm of the free end. The change in gauge resistance is found to be 0.152Ω . The beam is 0.25 m long with a width of 20 mm and a depth of 3 mm. The young's modulus for steel is 200 GN/m^2 . Calculate the gauge factor. **(10)**
- Q3** a) For the control system whose signal flow graph is shown below, using Mason's formula, find the system transfer function $C(s)/R(s)$. **(10)**



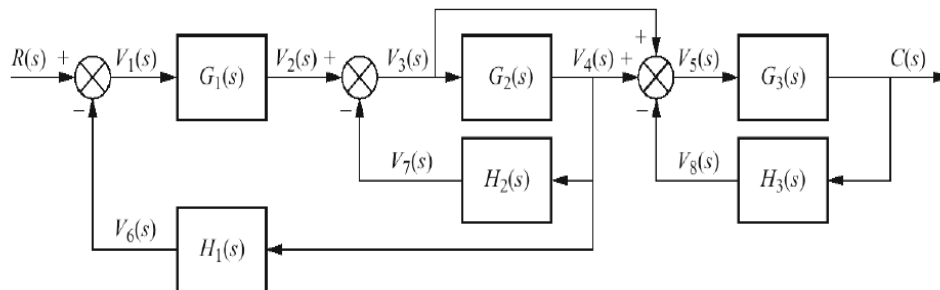
- b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take $C_d = 0.98$. (10)

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- Q4 a) Why Rotameter is called as variable area flow meter? Draw its neat sketch. (10)
 b) Explain with a neat sketch the constructional features and principles of working of a mcLeod gauge used for the measurement of pressure. (10)
- Q5 a) Sketch the Bode plot and assess the stability for the control system having open loop transfer function. Give some applications of Bode plot. (10)

$$G(H) H(S) = G(H) H(S) = \frac{120}{(S+2)(S+10)}$$

- b) Explain the theory of strain gauge. Also discuss the temperature compensation in strain gauges. (10)
- Q6 a) What do you mean by LVDT? Explain briefly. (10)
 b) Explain the different principles of working of capacitive transducer. Also discuss advantages, disadvantages and uses of capacitive transducer. (10)
- Q7 a) Define Strain Rosette. How it is used for strain measurement? (10)
 b) Determine the Transfer function. (10)



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