Registration no: | | | | | | | | | | |

Total Number of Pages: 03

B.Tech
PCME4403

7th Semester Regular / Back Examination 2016-17
MECHANICAL MEASUREMENT CONTROL
BRANCH: MECHANICAL
Time: 3 Hours
Max Marks: 70
Q.CODE: Y420

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

Q1 **Answer the following questions:** **(2 x 10)**

a) How do you classify the Instruments? Explain.
b) What do you mean by unit step and unit impulse response of first order systems?
c) Discuss any two transducers of displacement measurement with their advantages and disadvantages.
d) Define strain gauge. Explain different types of strain gauge.
e) Differentiate between precision and accuracy.
f) Define gauge factor. Derive the equation for gauge factor.
g) What do you mean by ballast circuit? Explain.
h) Explain the working of a bimetallic thermometer.
i) How measurement of torque on rotating shaft is done.
j) Explain generalized `measurement system elements with block diagram.

Q2 A single electrical resistance strain gauge of resistance 120 Ω and having a gauge factor of 2 is bonded to steel having an elastic limit stress of 400 kN/m^2 and modulus of elasticity 200 GN/m^2. Calculate the change in resistance, **(2+8)**

(a) due to a change in stress equal to 1/10 of the elastic range of steel and (b) due to a change of temperature of 20°C, if the material is advance alloy. The resistance temperature co-efficient of advance alloy is $20x\ 10^{-6}/\ ^0c$.

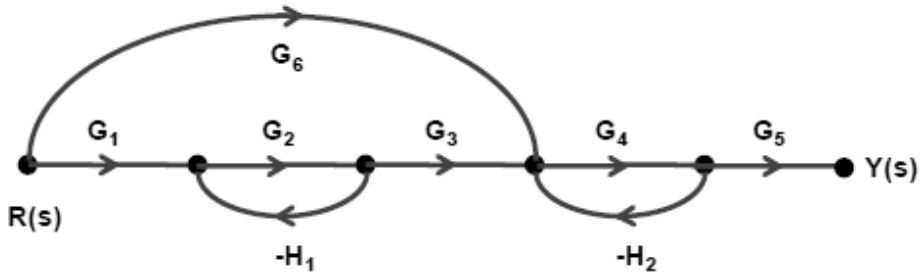
(b) Calculate the strain due to differential expansion of the gauge metal and steel if, co-efficient of linear expansion of steel is $12 \times 10^{-6}/\ ^0c$ and that of advance alloy is $16 X\ 10^{-6}/\ ^0c$.

Calculate also the change in resistance. Comment upon the results.

Q3 **a)** Explain the working, construction and limitations of Mcleod gauge. **(5)**

b) Explain the different principles of working of capacitive transducer. Also discuss advantages, disadvantages and uses of capacitive transducer. **(5)**

Q4 **a)** Determine the transfer functions using Mason's gain Formula. **(5)**



b) What are the elements of a functional of a measurement system? Explain briefly. **(5)**

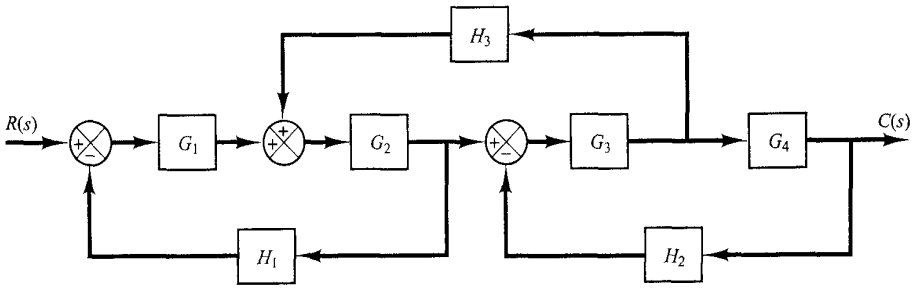
Q5 **a)** Why open loop system and closed loop systems are used? Explain briefly with their block diagrams. Give three examples of each system. **(5)**

b) A well type U-tube manometer using a liquid of specific gravity 0.8 has a well of 50 mm diameter and a tube of 2 mm bore. If a scale correctly graduated in mm is used and the datum is 0 mm. Calculate the reading on scale when a pressure difference of 80 mm of mercury is applied. Calculate the percentage error in reading and the actual error in N/M^2. Assume pressure on account of 1 mm of mercury = 133 N/M^2 and density of water as 1000 kg/m^3. **(5)**

Q6 **a)** What are the different static performance parameters available? **(5)**

b) What are the different types of transducer are used for measurement? Explain briefly. **(5)**

Q7 Simplify the block diagram shown in fig. Then obtained the closed- loop transfer function C (s) / R(s). **(10)**



Q8 **Write short answer on any TWO:** **(5 x 2)**

a) Rotameter

b) LVDT

c) Venturi meter and Pitot tube

d) Vibrometers and accelerometers