(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0287 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VIII) EXAMINATION, 2008-09

INSTRUMENTATION & PROCESS CONTROL

Time : 3 Hours] *[Total Marks : 100*

Note : (1) Attempt all questions

(2) All questions carry equal marks.

1 Attempt any **two** parts out of the following:

(a) A thermistor may be assumed to have a linear temperature resistance over a limited resistance range. The variation in resistance is -0.05/°C rise of temperature. The thermistor has a resistance of 1000 Ω at 20°C. Calculate the value of its resistance at 25°C. Supposing this thermistor is used in series with copper coil, what is the value of resistance of copper coil if the resistance at 20°C and 25°C is same for the series connected circuit comprising of coil and the thermistor? The resistance temperature coefficient of copper may be assumed as 0.004/°C.

(b) Explain the working principle of the LVDT. Also discuss its advantages and disadvantages.

(c) A potentiometer has a resistance of 5000 Ω and is rated at 3 W. What is the maximum allowable excitation Voltage?

Calculate the value of the sensitivity and resolution if the length of potentiometer is 0.1 m and there are 200 turns. Also calculate the percentage loading error at 0.67 of the travel if a meter of 5000 Ω is connected across the pot.

2 Attempt any two parts of the following:

(a) Explain working principle, merits and demerits of a capacitive transducer based on change in area of plates. Also find its sensitivity and draw related curves.

(b) A barium titanate pickup has the dimensions of 8 mm × 8 mm × 2 mm. The force acting on it is 8 N. The charge sensitivity of barium titanate is 175 pC/N and its permittivity is 12.5×10^{-9} F/m. If the Modulus of elasticity of barium titanate is 12×10^6 N/m^2, calcuate the strain. Also calculate the charge and the capacitance.

(c) With suitable diagram explain the moving coil type velocity transducer.

3 Attempt any two parts out of the following:

(a) What are electrical telemetering systems? With the help of diagram explain the motion balance current telemetering system.

(b) Explain digital data acquisition system and compare it with analog data acquisition system.

(c) Define the following terms:

(i) Modulation

(ii) Quantization

(iii) Resolution

(iv) Quantization Error

4 Attempt any **two** parts out of the following:

(a) Discuss the following marking mechanisms,

(i) Marking with ink filled stylus

(ii) Chopper bar

(iii) Electrostatic stylus

(iv) Optical Marking method

(v) Electric stylus marking

(b) Explain in brief

(i) fibre optic transducers

(ii) micro sensors

(iii) smart sensors

(c) With neat diagram explain the working principle of X-Y recorders. Also write its three applications.

5 Attempt any **two** parts out of the following:

(a) Explain the following :

(i) Process

(ii) Controlled Variable

(iii) Set point

(iv) Self-Regulation

(v) Sensor

(b) What is meant by mode of control? Explain how a proportional controller responds mathematically.

(c) With suitable example explain the pneumatic control of any process in an industry. Also draw the related block diagram.