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RF-3905

M. Sc. (Tech.) - I Examination

April / May – 2010

Instrumentation : Paper-III

(Measurement, Instrumentation Control)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Tech.) - I**

Name of the Subject :

☛ **Instrumentation : Paper-3**

☛ Subject Code No. : **3 9 0 5** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

(5) Assume the data, if required.

1 (a) State the methods of correction for interfering and modifying inputs. Expain in detail the compensation method with specific illustration. **5**

(b) Explain the applications of autocorrelation methods. **3**

(c) A resistance strain gage with R=120 Ω and F=2.0 is placed in an eual arm bridge in which all resistances are equal to 120 . The power voltage is 4.0 Volt. Calculate the detector current in microamperes per microinch of strain. The galvanometer resistance is 100 Ω. **5**

2 (a) Explain the working of a lock-in-complifier. Draw the typical waveforms and explain how it works as a rectifier. **6**

(b) A U-tube monometer employs a special oil having a specific gravity of 0.82 for the manometer fluid. One side of the manometer is open to local atmospheric pressure of 29.3 in Hg and the difference in column heights is measured as 20 cm ± 1.0 mm when exposed to an air source at 25°C. Standar acceleration of gravity is present. Calculate the pressure of air source in pascals and its uncertainty. **4**

OR

2 (a) Explain the following terms pertaining to the transducer characteristics. **6**

(i) Accuracy

(ii) Resolution

(iii) Repeatability

(iv) Reproducibility

(v) Hysteresis

(vi) Linearity

(vii) Rise time

(viii) Dead time

(b) A waveform consists of a signal of 10 μV with random fluctuatios of 50 μV rms. If the waveform is signal averaged, what will be the magnitude of the dc and ac components of the stored waveform at the output of the averager at the end of 100 averages and 1000 averages. **4**

3 (a) Explain how the capacitive transducer is used for liquid level measurement. **6**

(b) Use a power low series for a platinum RTD to calculate that resistance at 1000°C for a transducer which has a resistance of 100 at 20°C. If it was assumed erroneously that the calibration was linear over this temperature range, what would be the error in (i) the resistance and (ii) the measured temperature at 500°C. **4**

Where $\alpha = 3.664 \times 10^{-3}/°C$ and $\beta = -5.41 \times 10^{-7}/(°C)^2$.

OR

3 (a) Draw the generalised input-output configuration system system and explain it. What are the different types of input and explain them briefly with specific illustration. **6**

(b) A balance is constructed with the following dimensions. **4**

W_B = 50 gm; L = 21.2 cm

d_G = 0.3 cm; d_B = 0.01 cm

The pointer scale is graduated so that readings may be taken within one quarter of a degree. Estimate the uncertainty due to sensitivity in determining the weight of a mass of 1000 gm.

4 (a) What kinds of problems can be encountered in thermocouple use? **3**

(b) Explain briefly isolation amplifier. **3**

(c) Calculate the monolayer coverage time for a surface in organ at a pressure of 10^{-9} mbar and 20°C. The surface has a surface site density of $3 \times 10^{15} cm^{-2}$ and sticking probability of 0.1 for argon. **4**

OR

4 (a) Draw the block diagram of a digital multimeter and explain how it can be used for various measurements. **6**

(b) A thotovoltaic cell produces a voltage of 0.33V on open circuit when illuminated by 10 W/m^2 radiation intensity. A current of 2.2 mA is delivered into a 100 load at that intensity. **4**

Calculate :

(i) internal resistance of cell and

(ii) open circuit voltage at a radiation intensity of 25 w/m^2.

5 (a) How the flim thickness is to be mentioned as it is being deposited on the crystal. Describe various methods to determine the flim thickness. **6**

(b) An aveage photogenerated current of 100μA in a reverse biased photodiode is measured using a series resistance of 10 K and an amplifier with a bandwidth of 100 KHz. Compare the relative contributions of Johnson and shot noise voltage. Where KB=1.38×10^{-23} J/°K. **4**

OR

5 (a) Explain various methods for frequency modulation. **7**

(b) A quartz piezo electric crystal having a thickness of 2mm and a voltage sensitivity of 0.055 V.m/N is subjected to a pressure of 100 PSi. Calculate the output voltage. **3**