

Seat No. : 750

AK-118
April-2017
B.Sc., Sem.-VI
Ele.-311 : Physics & Electronics
(B : Instrumentation)

Time : 3 Hours]

[Max. Marks : 70

Instructions : (1) All questions are compulsory and carry equal marks.
(2) The symbols have their usual meaning.

1. (a) What is a transducer ? Describe the detailed classification of transducers based on various aspects. 5

OR

What is a strain gauge ? Explain the construction and working principle of bonded strain gauge. State the advantages of wire strain gauge.

(b) What is piezoelectric effect ? Describe the working principle of Piezoelectric transducer using the necessary figure. 5

OR

Describe the working of an electromagnetic flow meter with the neat diagram.

(c) A relay is controlled by a photoconductive cell having a dark resistance of $200 \text{ K}\Omega$. If its resistance is reduced to $2 \text{ K}\Omega$ when illuminated by light with intensity 400 lm/m^2 . The relay supplies 8 mA current from 24 V battery when illuminated by light with intensity 400 lm/m^2 and it is required to be de-energized when the cell is dark. Calculate the required series resistance and the dark current. 4

OR

The hot junction of a thermocouple is shifted from $200 \text{ }^\circ\text{C}$ to an environment of $700 \text{ }^\circ\text{C}$. If the time constant of thermocouple is 1 second, find the temperature of hot junction after time elapse of (i) 1 second (ii) 2 seconds (iii) 5 seconds.

2. (a) With a suitable diagram, explain how can a basic moving galvanometer be used to measure the different electrical quantities. Derive the necessary equations to convert a moving coil meter into (i) an ammeter and (ii) a voltmeter. What precautions will you observe when using such meter as an ammeter and voltmeter for the practical measurement? 10

OR

Give the comparison between VOM and VTVM. Using the neat diagrams explain the working of (i) Two tubes VTVM and (ii) FETVM.

- (b) The two resistors of $100\text{ K}\Omega$ and $50\text{ K}\Omega$ are connected in series with a DC source of 150 V . The voltage across $50\text{ K}\Omega$ resistor is measured with two voltmeters of sensitivities $1\text{ K}\Omega/\text{V}$ and $20\text{ K}\Omega/\text{V}$ respectively in 50 V range one by one. Determine the % error introduced by each meter during the measurement. What will you conclude from this calculations? 4

OR

A 1 mA d'Arsonval meter movement with an internal resistance of $100\ \Omega$ is to be used as multi range dc ammeter of current ranges (i) 10 mA (ii) 20 mA (iii) 50 mA respectively. Calculate (i) multiplying factor and (ii) shunt resistance for each of the range.

3. (a) What are the signal generators? State the types of signal generators. Describe the conventional standard signal generator using a neat schematic diagram. 7

OR

Draw the schematic block diagram of AF sine and square wave generator. Name the front panel controls of a typical AF generator and describe the function of each control. State the applications of fixed and variable frequency oscillators.

- (b) What is the difference between a signal generator and a function generator? Explain how can the different shaped waveforms be generated using a function generator. 7

OR

What is the difference between pulse and a square wave form? With help of a neat block diagram, explain the working of a sweep generator.

4. (a) State the principle of self generating inductive transducer. Explain the construction and working of LVDT (Linear Variable Differential Transformer). 5

OR

What are photoelectric transducers ? State different types of such transducers. Explain the construction and working of a solar cell.

- (b) Describe the rectifier type voltmeters used to measure AC voltages. 5

OR

Describe how can a basic moving coil meter be used as an ohm meter.

- (c) Explain how will you generate 1 kHz pulse waves of 30% duty cycle using different type of multivibrators. 4

OR

What is random noise ? Draw the block diagram of random noise generator.

5. Answer the following questions in short : 14

- (1) Write the name of any two biological transducers.
- (2) What do you mean by $3\frac{1}{2}$ digit DVM (Digital Voltmeter) ?
- (3) The three d' Arsonval meter movements have the full scale deflection currents of 50 μ A, 100 μ A and 500 μ A respectively. Which of these is most sensitive ? What will be its sensitivity in Ω/V ?
- (4) Why is the silicon more advantageous to use as the strain gauge material ?
- (5) What is the taut-band mechanism in a d' Arsonval meter movement ?
- (6) What is the difference between series and shunt type multi range voltmeter ?
- (7) On which factor does the signal level (amplitude) accuracy of a signal generator depend ?
- (8) Define duty cycle of a given pulse wave.

- (9) What will be the pulse width of 1 kHz pulse waves having 40% duty cycle ?
- (10) What do you mean by a time constant of thermistor ?
- (11) What is the use of buffer amplifiers in modern signal generators ?
- (12) What will be the Poisson ratio of a strain gauge having a gauge factor equal to 1.7 ?
- (13) What is the difference between photovoltaic cell and a solar cell ?
- (14) How can the true r.m.s. and average responding type AC voltmeter differ from each other ?
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