

**Subject: ELECTRONIC INSTRUMENTATION  
AND MEASUREMENT**

Time: 3 Hours

Max. Marks: 100

**JUNE 2011**

**NOTE: There are 9 Questions in all.**

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
  - **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
  - **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
  - **Any required data not explicitly given, may be suitably assumed and stated.**
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**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. In terms of three fundamental quantities power may be represented as \_\_\_\_\_

- |                  |                     |
|------------------|---------------------|
| (A) $MLT^{-2}$   | (B) $ML^2T^2$       |
| (C) $ML^2T^{-3}$ | (D) $ML^{-1}T^{-1}$ |

b. In measurement, which of the following characteristic(s) is/are desired \_\_\_\_\_

- |                     |                   |
|---------------------|-------------------|
| (A) accuracy        | (B) sensitivity   |
| (C) reproducibility | (D) all the above |

c. The voltage of a circuit is measured by a voltmeter, having input impedance comparable with the output impedance of the circuit, thereby causing an error in voltage measurement. This error can be called as \_\_\_\_\_

- (A) gross error.
- (B) systematic error.
- (C) error caused by misuse of instrument.
- (D) error caused by loading effect.

d. The base of SI systems are \_\_\_\_\_

- (A) meter, kilogram, second.
- (B) meter, kilogram, second, ampere.
- (C) meter, kilogram, second, ampere, kelvin, candela, mole.
- (D) meter, kilogram, second, ampere, kelvin, candela.

e. Measurement of medium resistance cannot be done by \_\_\_\_\_

- |                               |                               |
|-------------------------------|-------------------------------|
| (A) Ammeter-Voltmeter method. | (B) Wheatstone Bridge method. |
| (C) Substitution method.      | (D) Loss of Charge method.    |

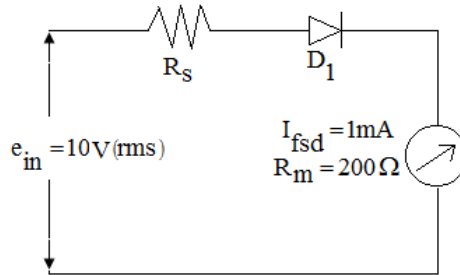
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- f. The dual slope integrating DVM technique is excellent in \_\_\_\_\_
- (A) noise rejection. (B) high voltage measurement.  
(C) frequency conversion. (D) low voltage measurement.
- g. The frequency band limit for AF generator are \_\_\_\_\_
- (A) 15Hz to 100KHz. (B) 30Hz to 300KHz.  
(C) 20Hz to 200KHz. (D) 10Hz to 10MHz.
- h. The function of the wave analyzer is \_\_\_\_\_
- (A) to measure the frequency of the signal.  
(B) to measure the phase shift difference.  
(C) to measure the harmonic distortion.  
(D) to measure the amplitude of each harmonic.
- i. In a Strip Chart Recorder, the data is recorded on \_\_\_\_\_
- (A) a flat circular chart. (B) a continuous roll of chart paper.  
(C) a fixed graph chart paper. (D) none of the above.
- j. Thermistor's resistance at room temperature ranges from \_\_\_\_\_
- (A)  $10\Omega$  to  $100\Omega$ . (B)  $100\text{ K}\Omega$  to  $100\text{ M}\Omega$ .  
(C)  $10\ \Omega$  to  $1\text{ M}\Omega$ . (D)  $100\ \Omega$  to  $10\text{ M}\Omega$ .
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**Answer any FIVE Questions out of EIGHT Questions.**  
**Each question carries 16 marks.**

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- Q.2** a. Explain the following characteristics:
- (i) Accuracy (ii) Precision  
(iii) Threshold (iv) Resolution (4×2 = 8)
- b. Three resistors, having resistances of  $250\Omega$ ,  $500\Omega$  and  $375\Omega$  are connected in parallel. The  $250\Omega$  resistor has a +0.025 fractional error, the  $500\Omega$  resistor has a -0.036 fractional error and the  $375\Omega$  resistor has a +0.014 fractional error. Determine:
- (i) the total resistance neglecting the errors.  
(ii) the total resistance considering the error of each resistor. (8)
- Q.3** a. Draw the circuit of Anderson's Bridge and derive an expression for the unknown inductance. (4+6=10)
- b. Enlist the difficulties in measurement of high resistance. (6)

- Q.4** a. What is a thermocouple? What are its limitations? Name various types of thermocouples. (6)
- b. Draw the block diagram of a digital multimeter and explain its operation. (6)
- c. Calculate the value of multiplier resistor for a 10V rms range on the voltmeter shown in Fig.1: (4)



**Fig.1**

- Q.5** a. With the help of neat block diagram, explain the working of a Dual Slope Digital Voltmeter. (8)
- b. Explain the working of Decade Counter with suitable diagram. (8)
- Q.6** a. Draw the basic block diagram of CRO and explain all its elements. What are the advantages of using negative high voltage supply? (12)
- b. Enlist the standard specifications of a Signal Generator. (4)
- Q.7** a. Explain how the frequency measurement is done by using the Heterodyne Wave Analyzer with a suitable block diagram. (7)
- b. Write the principle of calorimetric method and explain how the power in lossy cable is measured by using thermometer? (9)
- Q.8** a. If the frequency of a signal to be recorded with a Strip Chart Recorder is 20 Hz. What must be the chart speed used to record one complete cycle on 5mm of recording paper? (6)
- b. List out the advantages & disadvantages of Direct Recording. (6)
- c. Write any four requirements of Data Recording. (4)
- Q.9** a. What is the working principle of an LVDT? Describe its construction with the help of a neat diagram. Also give its limitations. (10)
- b. A displacement transducer with a shaft stroke of 3.0 inches is applied to the circuit shown in Fig.2.

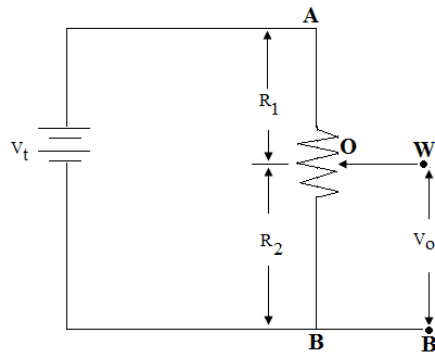


Fig.2

Total resistance of the potentiometer is  $5\text{K}\Omega$  and the applied voltage  $V_t$  is  $5\text{V}$ .  
When the wiper is 0.9 inches from B, what will be the value of the output voltage?  
(6)