



**POSTAL
BOOK PACKAGE**

2025

CONTENTS

**ELECTRONICS
ENGINEERING**

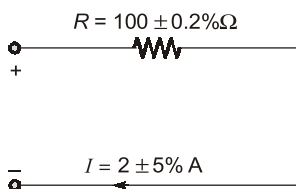
Objective Practice Sets

Electronic Measurements and Instrumentation

1.	Introduction	2 - 9
2.	Measurement of Resistance	10 - 17
3.	A.C. Bridges	18 - 25
4.	Electromechanical Indicating Instruments	26 - 38
5.	Measurement of Power & Energy	39 - 46
6.	Cathode Ray Oscilloscope (CRO)	47 - 54
7.	Transducers	55 - 62
8.	Miscellaneous	63 - 68

Introduction

- Q.1** The difference between the indicated value and the true value of a quantity is
 (a) Gross error (b) Absolute error
 (c) Dynamic error (d) Relative error
- Q.2** Consider the following statements regarding "precision" of an instrument:
 1. Precision is a measure of the degree of agreement within a group of measurements.
 2. Precision is necessary, but not sufficient condition for accuracy.
 Which of the above statements is/are correct?
 (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2
- Q.3** A 0 to 200 V voltmeter has a guaranteed accuracy of 1% of full scale reading. The voltage measured by this instrument is 50 V. What is the limiting error?
 (a) 4% (b) 2%
 (c) 1% (d) 0.25%
- Q.4** Two meters X and Y require 40 mA and 50 mA, respectively, to give full-scale deflection, then
 (a) sensitivity can not be judged with given information.
 (b) both are equally sensitive.
 (c) X is more sensitive.
 (d) Y is more sensitive.
- Q.5** In the circuit given in the figure, the limiting error in the power dissipation ' I^2R ' across the resistor R is



- (a) 1.2% (b) 5.2%
 (c) 10.2% (d) 25.2%

- Q.6** The dead zone in a pyrometer is 0.125% of span. The instrument is calibrated from 500°C to 2000°C. What temperature range must occur before it can be detected in degree centigrade _____.
- Q.7** A voltmeter reading 70 V on its 100 V range and an ammeter reading of 80 mA on its 150 mA range are used to determine power dissipation in a resistor. Both these instruments are guaranteed to be accurate within $\pm 2\%$ at full scale deflection. The limiting error (in percentage) in power measurement is _____ .
 (Answer upto one decimal place)
- Q.8** A first order instrument is characterized by
 (a) Time constant only
 (b) Static sensitivity and time constant
 (c) Static sensitivity and damping coefficient
 (d) Static sensitivity and time constant and natural frequency of oscillations
- Q.9** A resistance of 108 Ω is specified using significant figures as indicated below:
 1. 108 Ω
 2. 108.0 Ω
 3. 0.000108 M Ω
 Among these:
 (a) 1 represents greater precision than 2 and 3
 (b) 2 represents greater precision but 1 and 3 represents same precision
 (c) 2 and 3 represent greater precision than 1
 (d) 1, 2 and 3 represent the same precision

- Q.10** Match **List-I** (Accuracy) with **List-II** (Type of the standard) and select the correct answer:

List-I	List-II
A. Least accurate	1. Primary
B. More accurate	2. Secondary
C. Much more accurate	3. Working
D. Highest possible accurate	4. International

Q.31 Consider the following properties of any measurement system:

1. Fidelity
2. Reproducibility
3. Lag
4. Dead zone

Which of these are both dynamic and undesirable characteristics of a measurement system?

- (a) 1 and 3 both (b) 3 only
(c) 3 and 4 both (d) 2, 3 and 4

Q.32 A 4 dial decade box has

Decade a of $10 \times 1000 \Omega \pm 0.2\%$

Decade b of $10 \times 100 \Omega \pm 0.1\%$

Decade c of $10 \times 10 \Omega \pm 0.5\%$

Decade d of $10 \times 1 \Omega \pm 2\%$

If the setting is at 8172Ω . Then range of resistance value is

- (a) $(8165.5 \text{ to } 8178.5) \Omega$
(b) $(8159.5 \text{ to } 8184.5) \Omega$
(c) $(8155.5 \text{ to } 8188.5) \Omega$
(d) None of these



Answers Introduction

1. (b) 2. (c) 3. (a) 4. (c) 5. (c) 6. (1.875) 7. (6.6) 8. (b) 9. (b)
10. (c) 11. (c) 12. (b) 13. (c) 14. (b) 15. (c) 16. (b) 17. (d) 18. (5)
19. (b) 20. (a) 21. (b) 22. (a) 23. (1) 24. (1.956) 25. (b) 26. (b) 27. (d)
28. (b) 29. (a) 30. (c) 31. (b) 32. (c)

Explanations Introduction

1. (b)

- Absolute error = Measured/Indicating value – True value
- Relative error = $\frac{\text{Measured value} - \text{True value}}{\text{True value}}$

2. (c)

- Precision is a measure of reproducibility of measurements i.e. for a fixed value of variable, it is the measure of the degree to which successive measurements differ from one another.
- Precision is not sufficient condition for accuracy since precision of an instrument does not guarantee of the accuracy of the instrument.
- Precision is not the guarantee of accuracy.

3. (a)

Given, full scale reading = 200 V
Magnitude of limiting error of instrument is

$$= \frac{1}{100} \times 200 = 2 \text{ V}$$

$$\therefore \text{Relative limiting error} = \frac{2}{50} \times 100 = 4\%$$

4. (c)

- Sensitivity $\propto \frac{1}{\text{Deflection factor}}$
- Static sensitivity = $\frac{1}{I_{FSD}}$

Here X have lower I_{FSD} and hence X is more sensitive meter.

5. (c)

$$P = I^2 R$$

Limiting error is given as,

$$\begin{aligned} \frac{dP}{P} \% &= 2 \frac{dI}{I} \% + \frac{dR}{R} \% \\ &= 2 \times 5\% + 0.2\% = 10.2\% \end{aligned}$$

6. Sol.

$$\begin{aligned} \text{Span} &= 2000^\circ\text{C} - 500^\circ\text{C} \\ &= 1500^\circ\text{C} \end{aligned}$$

\therefore Temperature change

$$\begin{aligned} &= \frac{0.125}{100} \times 1500 \\ &= 1.875^\circ\text{C} \end{aligned}$$

7. Sol.

The magnitude of limiting error of the voltmeter
 $= 0.02 \times 100 = 2 \text{ V}$

Percentage limiting error at 70 V

$$= \frac{2}{70} \times 100 = 2.857\%$$

The magnitude of limiting error of the ammeter

$$= 0.02 \times 150 \text{ mA} = 3 \text{ mA}$$

Percentage limiting error at 80 mA

$$= \frac{3}{80} \times 100 = 3.75\%$$

$$P = VI$$

Percentage limiting error in power measurement

$$= 2.857\% + 3.75\%$$

$$= 6.607\% \approx 6.6\%$$

8. (b)

For first order instruments, transfer function is,

$$\text{T.F.} = \frac{K}{1+sT}$$

where, K = static sensitivity

T = time constant

9. (b)

1. 108Ω has 3 significant figures.
2. 108.0Ω has 4 significant figures.
3. $0.000108 \text{ M}\Omega$ can be written has 108Ω .

So, it has 3 significant figures.

The more the significant figures, the greater the precision of measurement.

Hence, option (b) is correct.

10. (c)

- International standards represents the units of measurements which is closest of highest possible accuracy attainable.
- Order of accuracy:

$$\text{International standards} > \text{Primary standards} > \text{Secondary standards} > \text{Working standards}$$

11. (c)

Random errors or residual errors are computed using statistical methods. These errors are caused by the happenings or disturbances which we are unaware of. These are not caused by arithmetic error while taking readings. Hence, statement (II) is wrong.

12. (b)

Three types of forces are needed for the satisfactory operation of any indicating instrument.

These are:

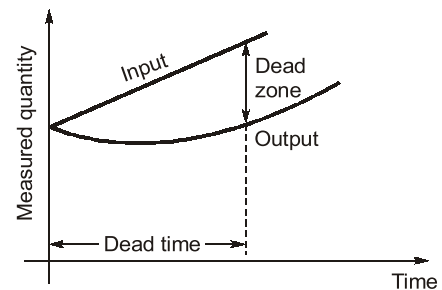
1. Deflecting force
2. Controlling force
3. Damping force

13. (c)

Damping torque is required to damp out the oscillation of pointer. It is the controlling torque (T_c) which bring the pointer to zero position for no deflection. Hence statement (A) is wrong.

14. (b)

In dead zone, there is no change in output, though input changes.

**15. (c)**

For $n = 9$ readings, ($n < 20$)

- Standard deviation = $\sigma = \sqrt{\frac{\sum d^2}{n-1}} = \sqrt{\frac{\sum d^2}{8}}$
- Variance = $V = \sigma^2 = \frac{\sum d^2}{8}$

16. (b)

- Systematic errors are classified as instrument errors, observation errors and environmental errors.
- Errors due to shortcoming in the instrument is instrument error.
- Also, due to effects of external environment, systematic errors occur. Hence, (2), (3) and (4) are correct.

17. (d)

$$\text{LE} = \frac{\text{GAE} \times \text{FSR}}{\text{Reading}}$$