



UNITS AND MEASUREMENT

Test Paper-II

Max marks: 30

Time: 90Mts

1. What is the basis of atomic clock? [1]
2. Define second [1]
3. Name the institute which has been given the responsibility of maintenance and improvement of physical standards. Give the uncertainty in time realization measured through cesium atomic clocks [1]
4. What is meant by error in measurement? [1]
5. Distinguish between accuracy and precision [1]
6. What are the different types of errors? Briefly explain. [3]
7. Briefly explain how you will determine percentage error. [3]
8. Two clocks are being tested against a standard clock located in a national laboratory. At 12:00:00 noon by the standard clock, the [2]

	Clock I	Clock II
Monday	12:00:05	10:15:06
Tuesday	12:01:15	10:14:59
Wednesday	11:59:08	10:15:18
Thursday	12:01:50	10:15:07
Friday	11:59:15	10:14:53
Saturday	12:01:30	10:15:24
Sunday	12:01:19	10:15:11

If you are doing an experiment that requires precision time interval measurements, which of the two clocks will you prefer?

9. We measure the period of oscillation of a simple pendulum. In successive measurements, the readings turn out to be 2.63s, 2.56s, 2.42s, 2.71s and 2.80s. Calculate the absolute errors, relative error or percentage error. [3]
- 10 Show that when two quantities are added or subtracted, the absolute error in the final result is the sum of the absolute errors in the individual quantities. [2]
11. The temperatures of two bodies measured by a thermometer are $t_1=20^\circ\text{C} \pm 0.5^\circ\text{C}$ and $t_2=50^\circ\text{C} \pm 0.5^\circ\text{C}$., Calculate the temperature difference and error there in. [2]
- 12 Show that when two quantities are multiplied or divided, the relative error in the result is the sum of the relative errors in the multipliers. [2]
- 13 The resistance $R=V/I$ where $V= (100\pm 5)$ V and $I = (10\pm 0.2)$ A. Find the percentage error in R. [2]
- 14 Two resistors of resistances $R_1=100 \pm 3$ ohm and $R_2=200 \pm 4$ ohm are connected (a) in series, (b) in parallel. Find the equivalent resistance of the (a) series combination, (b) parallel combination. Use for (a) (the relation $R = R_1 + R_2$ and for (b) $\frac{1}{R_1} = \frac{1}{R_1} + \frac{1}{R_2}$ and $\frac{\Delta R}{R^2} = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$ [2]
- 15 a. Show that the relative error in a physical quantity raised to the power of k is the k times the relative error in the individual quantity. b. Find the relative error in Z, if $Z=A^4 B^{1/3} / C D^{3/2}$ [2]