Sheet (1)

REVIEW QUESTIONS

1. Explain gross errors and systematic errors. Give examples of each.

2. Define absolute errors and relative errors.

3. Discuss the resultant error in calculations involving quantities with stated accuracies when the quantities are:

(a) Added   (b) Subtracted,

(c) Multiplied (d) Divided, and

(e) One quantity is raised to the power of the other.

PROBLEMS

1. For the analog instrument in Figure (1), determine the meter reading when the selector switch is set to (a) 2.5 mA, (b) 5V, and (c) 100 mA.

2. A batch of resistors that each have a nominal resistance of 330 Ω are to be tested and classified as ± 5 % and ± 10 % components. Calculate the maximum and minimum absolute resistance for each case.

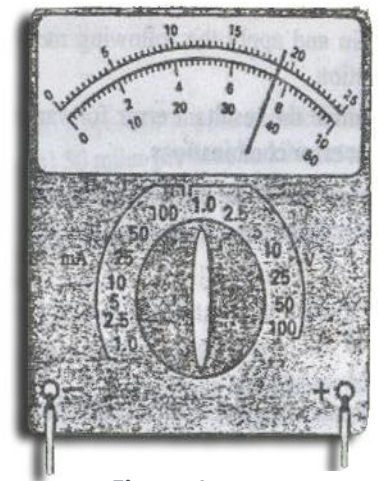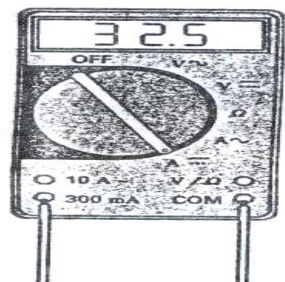3. Estimate the measurement precision of the digital instruments in Figure(2).

Figure 1

4. Estimate the measurement precision of the digital and analog voltmeter instrument in Figure (3).
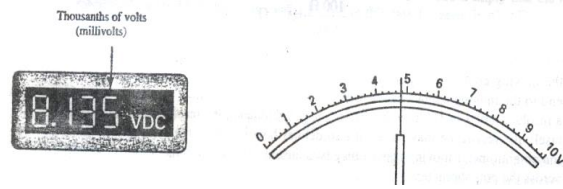

Figure 2

Figure (3) Analog and digital voltmeter instruments displays

5. Three of the resistors referred to in Problem (2) are connected in series. One has a ±5 % tolerance, and the other two are ± 10 %. Calculate the maximum and minimum values of the total resistance.

6. A dc power supply provides currents to four electronic circuits. The currents are 37 mA, 42 mA, 13 mA and 6.7 mA. The first two are measured with an accuracy of ±3 % and the other two are measured with ±1 % accuracy. Determine the maximum and minimum levels of the total supply current.

7. Two currents from different sources flow in opposite directions through a resistor. I1 is measure as 79 mA on a 100 mA analog instrument with accuracy of ±3 % of full scale. I2 determined as 31 mA is measured on digital instrument has an accuracy of (0.5% Rdg + 1 d). Calculate the maximum and minimum levels of current in R1.(Very Important)

8. The voltages at opposite ends of a 470 Ω, ±5 % resistor are measured as V_1=12 V and V_2=5 V. The measuring accuracies are ±0.5 V for V_1 and ±2 % for V_2. Calculate the level of current in the resistor, and specify its accuracy.

9. A resistor R_1 has a potential difference of 25 V across its terminals, and a current of 63 mA. The voltage is measured on a 30 V analog instrument with an accuracy of ±5 % of full scale. The current is measured on digital instrument has an accuracy of (0.3% Rdg + 1 d). Calculate the resistance of R_1 and specify its tolerance.

10. A 470 Ω, ±10 % resistor has a potential difference of 12 V across its terminals. If the voltage is measured with an accuracy of ±6 %, determine the power dissipation in the resistor, and specify the accuracy of the result.

$\mathcal{GOOD\ LUCK}$