Tutorial-2

EE 101: Electrical Sciences

DEPARTMENT OF ELECTRONICS & ELECTRICAL ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

*(First question is the **Pre-Tutorial Assignment problem** to be solved in the space provided.)*

Name: Roll No.: Tutorial Group:

1. Determine the voltages registered by a voltmeter between the following points in this circuit:

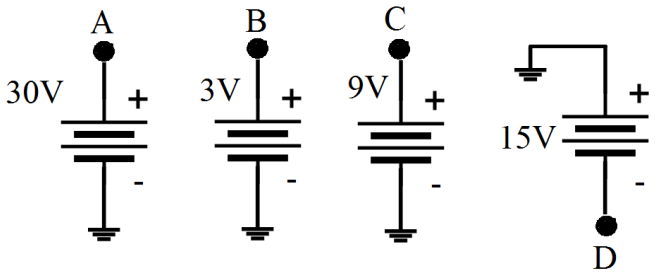

Fig. Q-1

a.	$\mathbf{V_A}$ = *(red lead on A, black lead on ground)*
b.	$\mathbf{V_B}$ = *(red lead on B, black lead on ground)*
c.	$\mathbf{V_C}$ = *(red lead on C, black lead on ground)*
d.	$\mathbf{V_D}$ = *(red lead on D, black lead on ground)*
e.	$\mathbf{V_{AC}}$ = *(red lead on A, black lead on C)*
f.	$\mathbf{V_{DB}}$ = *(red lead on D, black lead on B)*
g.	$\mathbf{V_{BA}}$ = *(red lead on B, black lead on A)*
h.	$\mathbf{V_{BC}}$ = *(red lead on B, black lead on C)*
i.	$\mathbf{V_{CD}}$ = *(red lead on C, black lead on D)*

2. Use Kirchhoff's Voltage Law to calculate the magnitude and polarity of the voltage across resistor **R_4** in this resistor network (Fig. Q-2):

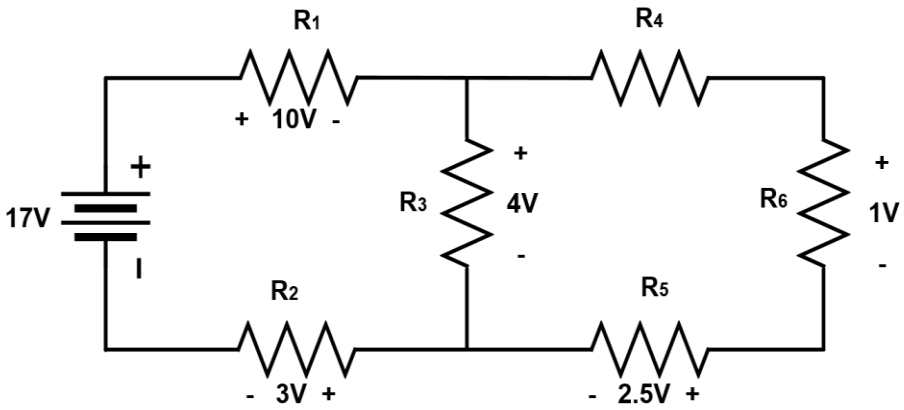

Fig. Q-2

3. Use Kirchhoff's Current Law to calculate the magnitudes and directions of currents through all resistors in this circuit (Fig. Q-3):

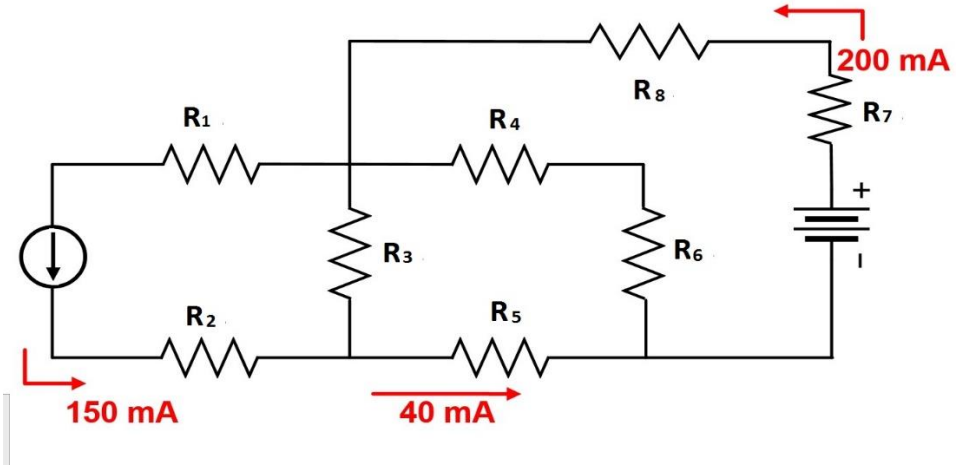

Fig. Q-3

4. Determine the current through **battery #2** in this power system, if the generator is outputting **50 amps**, **battery #1** is charging at a rate of **22 amps,** and the light bulbs draw **5 amps** of current each. Be sure to indicate whether battery #2 is charging or discharging (Fig. Q-4):

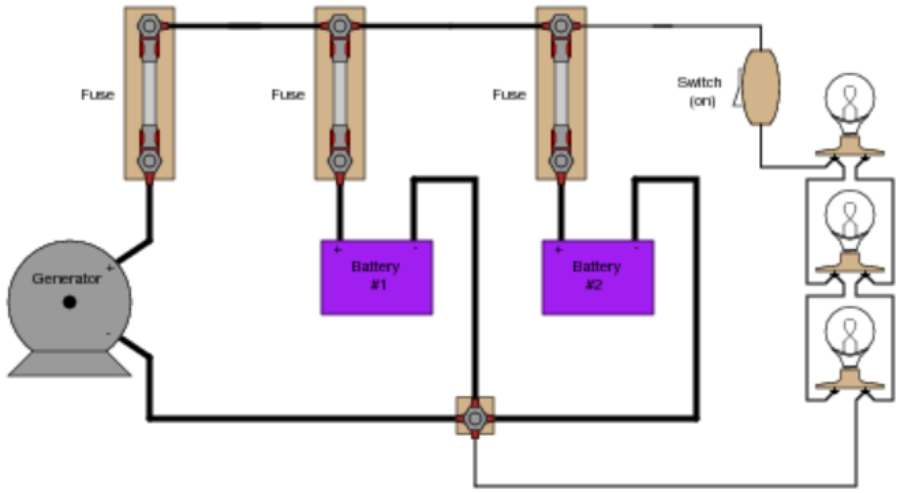

Fig. Q-4

5. Find the **decimal (base 10)** representation of the number $\mathbf{(1010101.111)_2}$.
6. Find the **base 2** representation of the number $\mathbf{(43.6875)_{10}}$.
7. Using identities of Boolean algebra, simplify the following expression as much as possible:

$$\boldsymbol{F(A,B,C,D) = \bar{A}B + B\bar{C} + BD + ABC\bar{D}}$$

8. Using identities of Boolean algebra, simplify the following expression as much as possible:

$$\boldsymbol{F(A,B,C,D) = C\bar{D} + \bar{A}C + ABCD + A\bar{B}\bar{C}\bar{D}}$$