1. (20 pts) The ammeter, A, reads 40 mA.
   a) The power dissipated by $R_2$ is 90 mW, what is the value of $R_2$?
   
   $R_2 = 80 \Omega$
   
   b) What is the value of $V_S$?
   
   c) How much power is provided by the source?
   
   $P_S = 90 \text{ mW}$

2. (23 pts) a) Use the method of superposition to find $V_{R_1}$ and $I_{R_2}$. Be sure to clearly show and circle your intermediate results.

3. (18 pts)
   a) Find and draw the Thévenin equivalent of the circuit shown. The load resistor is $R_L$.
   
   b) Find and draw the Norton equivalent of the same circuit.
   
   c) Find the load voltage using either your Thévenin or Norton equivalent circuit.

4. (18 pts) Nodal analysis.
   a) Select a ground (reference) node and label it on the schematic (draw ground symbol).
   
   b) Label other nodes and currents as necessary to perform nodal analysis.
   
   c) How many simultaneous equations will you need to perform this analysis?
   
   d) Write all the necessary equations in terms of the resistors, the sources, and the unknown nodes. Just write and circle the equations, do not try to simplify or solve them.
5. (21 pts) The questions below are similar to what you might see on the FE exam, except that guesses could cost you points here. They expect you to average about 2 minutes per question. Circle the right answers.

a) The value of the resistor is most nearly:

   (A) 0.1 Ω
   (B) 2.7 Ω
   (C) 10 Ω
   (D) 30 Ω
   (E) 33.3 Ω

b) If a 3-ohm resistor is connected across terminals xy in the circuit shown, the current through it would be most nearly:

   (A) 0.5 A
   (B) 0.75 A
   (C) 1.75 A
   (D) 2.0 A
   (E) 3.75 A

c) Find I₂ in amps.

   (A) 9
   (B) 12
   (C) 18
   (D) 24
   (E) 27

d) The voltage across the 50-ohm resistor in the circuit shown is most nearly:

   (A) 0.95 V
   (B) 2.4 V
   (C) 5.95 V
   (D) 8.33 V
   (E) 14.3 V

Answers

1. a) 25-Ω b) 8.3-V c) 498-mW

2. -1.5-mA 18-V

3. a) 7.2-V b) 9-mA c) 2.4-V

4. a) b) c) 2

d) node a: \[ I_S = \frac{V_{a - 0}}{R_2} + \frac{V_a - V_b}{R_1} \]

node b: \[ \frac{V_{a - 0}}{R_1} + \frac{V_s - V_b}{R_3} = \frac{V_{b - 0}}{R_4} \]