Remember, to get the most possible partial credit, always show all the intermediate values that you can calculate. If further calculations depend on a value that you can't figure out, just use a letter (like \( I_{R1} \)) or a guessed value and proceed.

Note: feel free to show answers & work right on the schematic.

1. (16 pts) In the circuit shown, find:
   a) The voltage across \( R_2 \). \( V_{R2} = \) ?
   b) The current through \( R_3 \). \( I_{R3} = \) ?

2. (20 pts) In the circuit shown find the voltage source (\( V_S \)), the power input by the source (\( P_S \)), and the resistor values; \( R_3 \) and \( R_4 \).

Reminder, you were asked for 4 items: \( V_S \), \( P_S \), \( R_3 \), and \( R_4 \).

3. (19 pts) a) Use the method of superposition to find the current through \( R_2 \). Be sure to clearly show and circle your intermediate results.

4. (16 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. (20 pts) For the waveform shown, find:
   a) peak-to-peak voltage, \( V_{pp} \) 
   b) amplitude, \( A \) 
   c) period, \( T \) 
   d) frequency \( f \) in cycles/sec or Hz 
   e) frequency \( \omega \) in radians/sec 
   f) the phase angle in degrees 
   g) a complete expression for \( v(t) \), include numbers and units

The questions below are similar to what you might see on the FE exam. They expect you to average about 2 minutes per question.

6. (4 pts) Find the magnitude and sign of the power, in watts, absorbed by the circuit element in the box.
   a) -20 
   b) -8 
   c) 8 
   d) 12

7. (5 pts) What are the Thevenin equivalent resistance and voltage between terminals A and B?
   a) \( R_{Th} = 3 \Omega \), \( V_{Th} = 45 \text{ V} \) 
   b) \( R_{Th} = 7.5 \Omega \), \( V_{Th} = 7.5 \text{ V} \) 
   c) \( R_{Th} = 7.5 \Omega \), \( V_{Th} = 60 \text{ V} \) 
   d) \( R_{Th} = 12 \Omega \), \( V_{Th} = 5 \text{ V} \)

Answers
1. a) 6-V 
   b) 53.3-mA 
2. \( V_S := 7.4 \text{ V} \) \( P_S := 0.215 \text{ W} \) \( R_3 := 200 \Omega \) \( R_4 := 300 \Omega \)
3. \( I_{R2,V} := -1.5 \text{ mA} \) \( I_{R2,I} := -2.0 \text{ mA} \) \( I_{R2} := -0.5 \text{ mA} \)
4. a) & b) 
   c) 2 
   d) \( \frac{V_S - V_a}{R_1} = \frac{V_a - 0}{R_2} + \frac{V_a - V_b}{R_3} \), \( \frac{V_a - V_b}{R_3} = \frac{V_b - 0}{R_4} + I_S \)
5. a) 6-V 
   b) 3-V 
   c) 6-ms 
   d) 167-Hz 
   e) 1047 rad/sec 
   f) -60\(^\circ\) 
   g) 3-V \cdot \cos \left( \frac{1047 \text{ rad}}{\text{sec}} t - 60\text{ deg} \right) + 1-V 
6. c 7. a