ECE 230 Circuit Analysis Test Cases

All book problems listed below are from the 7th edition which is the required book for the course.

Hand-written (scanned) or digital solutions (i.e. OneNote) should be included along with the test results. Each group should do their own work.

Project 1: Basic Concepts

- already included in template (based on book problems and other)

Project 2: Circuit Analysis Techniques

- Nodal Analysis:
  - solve problem 3.20 in the book
  - solve problem 3.24 in the book (set up equations only)
- Matrix Math:
  - solve problem 3.24 in the book (solve based on nodal analysis equations)
  - solve problem 3.48 in the book (solve based on mesh analysis equations)
  - solve problem 3.52 in the book (solve based on mesh analysis equations)
- Mesh Analysis:
  - solve problem 3.48 in the book (set up equations only)
  - solve problem 3.52 in the book (set up equations only)
- Superposition:
  - solve problem 4.14 in the book
  - solve problem 4.19 in the book

Project 3: Circuit Transformation Techniques

- Source Transformations:
  - solve problem 4.24 in the book
  - solve problem 4.30 in the book
- Thevenin Equivalent Circuits:
  - solve problem 4.38 in the book
  - solve problem 4.42 in the book
- Norton Equivalent Circuits:
  - solve problem 4.48 in the book
  - solve problem 4.63 in the book
- Maximum Power Transfer:
  - solve problem 4.71 in the book

Project 4: Op-Amps and Other Passive Components

- Op-Amp Configurations:
  - solve problem 5.20 in the book
  - solve problem 5.32 in the book
- Series/Parallel Inductor/Capacitor Combinations:
  - solve problem 6.18 in the book
  - solve problem 6.24 in the book (hint: see voltage divider rule for capacitors in 6.25)
  - solve problem 6.53 in the book

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- Voltage/Current Relationships for Inductors/Capacitors:
  - solve problem 6.10 in the book
  - solve problem 6.11 in the book
  - solve problem 6.40 in the book
  - solve problem 6.42 in the book
- Energy Calculations for Inductors/Capacitors:
  - solve problem 6.32 in the book
  - solve problem 6.61 in the book (hint: see current divider rule for inductors in 6.59)

Project 5: Differential Equation Circuit Techniques and Singularity Functions

- First-Order Circuits:
  - solve problem 7.44 in the book and plot i(t)
  - solve problem 7.55 in the book and plot v(t)
  - solve problem 7.70 in the book and plot v(t)
  - solve problem 7.85 in the book
- Second-Order Circuits:
  - solve problem 8.34 in the book and plot i(t)
  - solve problem 8.42 in the book and plot v(t)
  - solve problem 8.48 in the book and plot i(t) and v(t)
- Singularity Functions:
  - solve problem 7.26 in the book (all 4 cases) and show waveform plots

Project 6: Impedance Calculations, Phasors and Single-Phase AC Power

- Series/Parallel Impedance Combinations:
  - solve problem 9.44 in the book and plot i(t) – let MATLAB do the complex math!
  - solve problem 9.52 in the book and plot Vo and Is as phasors – see MATLAB "compass"
  - solve problem 10.08 in the book and plot Is and Io as phasors
- Phasors: (see MATLAB "compass" function for details >>help compass)
  - solve problem 9.11 in the book and plot all 4 as phasors and in time domain**
  - solve problem 9.17 in the book and plot all 3 as phasors and in time domain**
  - ** For each problem, plot all waveforms on 1 phasor and 1 time domain graph
- Single-Phase AC Power Calculations:
  - solve problem 11.28 in the book
  - solve problem 11.44 in the book
  - solve problem 11.62 in the book
- Power Factor Correction:
  - solve problem 11.74 in the book

Project 7: Transformers and Filters

- Linear Transformers:
  - solve problem 13.11 in the book
  - solve problem 13.26 in the book
- Ideal Transformers:
  - solve problem 13.43 in the book

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  - solve problem 13.70 in the book
- Transfer Functions: (>>help tf) to learn more about MATLABs transfer function code
  - solve problem 14.06 in the book and plot the transfer function (>> help bode)
- First-Order Filters:
  - solve problem 14.48 in the book and plot the transfer function
  - solve problem 14.103 in the book and plot the transfer function