Sample Question

Course Title: Circuit Theory and Analysis

NB: 1. All question only for theoretical part.
2. Read the reference book for Mathematical question.

PART-A

Set-01(*Chapter: 4,5*)

1. a) Define the following terms: Ohm's law, Circuit, Power, Energy and Efficiency.
b) Write down the Kirchhoff's voltage law.
c) State and explain the Voltage Divider Rule (VDR) with suitable diagram.
d) What do you understand by notation or Double-Subscript Notation or Single-Subscript Notation?
e) See all highlighted math from reference book.

Set-02 (*Chapter: 6,7*)

2. a) Define parallel circuit, Open and Short circuits.
b) State and explain current divider rule with suitable diagram.
c) Write down the Kirchhoff's current law.
d) See all highlighted math from reference book.

Set-03 (*Chapter: 8*)

3. a) Explain source conversion procedure.
b) Write down the steps of Branch-Current analysis procedure.
c) Write down the steps of Mesh Analysis procedure.
d) Write down the steps of Nodal Analysis procedure.
e) See all highlighted math from reference book.

Set-04 (*Chapter: 9*)

4. a) With a suitable illustration, State and explain Superposition's theorem.
b) State and explain Thévenin's network theorem with a suitable illustration.
c) State and explain Norton's network theorem with a suitable illustration.
d) State Maximum Power Transfer theorem. What load should be applied to a system to ensure that the load is receiving maximum power from the system? Or Drive the expression to ensure that the load is receiving maximum power from the network. (*answer: equation 9.3*).
e) See all highlighted math from reference book.

PART-B

Set-05 (*Chapter: 13*)

5. a) Define the following terms: Waveform, Instantaneous value, Peak Amplitude. Peak Value, Peak-to-Peak Value, Periodic Waveform, Period and Cycle.
b) What do you mean by Leading and Lagging Waveform?
c) Give the concepts of average value with suitable example.
d) Define rms or effective value. Show that the equivalent dc value of a sinusoidal current or voltage is $I_{dc} = \frac{I_m}{\sqrt{2}}$, where the symbols have their usual meaning. (answer: *book, page: 567*).
e) See all highlighted math from reference book.

Set-06 (*Chapter: 14*)

6. a) Show that the inductive reactance of an inductor in ac sinusoidal network is $X_L = \omega L$, where the symbols have their usual meaning.
b) Show that the capacitive reactance of a capacitor in ac sinusoidal network is $X_C = \frac{1}{\omega C}$, where the symbols have their usual meaning.
c) Deduce the expression for average power delivered to a load for sinusoidal voltage and current.

d) Explain the terms: (i) Power factor (ii) Phasor (iii) Phasor diagram with suitable figure.

e) See all highlighted math from reference book.

Set-07 (*Chapter: 15*)

7. a) Briefly explain the impedance of a resistive element in ac network with suitable illustration. Or Show that the impedance of a resistive element in ac network is $Z_R = R < 0^0$, where the symbols have their usual meaning. (answer: *book, equation: 15.1*).

b) Briefly explain the impedance of an inductive element in ac network with suitable illustration. Or Show that the impedance of an inductive element in ac network is $Z_L = X_L < 90^0$, where the symbols have their usual meaning. (answer: *book, equation: 15.2*).

c) Briefly explain the impedance of a capacitive element in ac network with suitable illustration. Or Show that the impedance of a capacitive element in ac network is $Z_C = X_C < -90^0$, where the symbols have their usual meaning. (answer: *book, equation: 15.3*).

d) Define Admittance and Susceptance.

e) See all highlighted math from reference book.

Set-08 (*Chapter: 20*)

8. a) Define resonance and Quality Factor (Q).
What do you understand by resonant circuit? Show that the resonant frequency of series resonant circuit is $f_s = \frac{1}{2\pi\sqrt{LC}}$, where the symbols have their usual meaning.

b) Show that the quality factor of series resonant circuit is $Q_s = \frac{1}{R}\sqrt{\frac{L}{C}}$, where the symbols have their usual meaning.

c) Draw and explain the total impedance (Z_T) versus frequency curve for the series resonant circuit. (answer: *book, page:877*).

d) What do you understand by selectivity? Show that the bandwidth of series resonant circuit is $BW = \frac{f_s}{Q_s}$, where the symbols have their usual meaning.

e) See all highlighted math from reference book.