Student ID:	2018-3-60-063

September 28, 2020

EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Final Exam, Summer 2020 Semester

Course: CSE 109/209 Electrical Circuits, Section-4
Instructor: Rashedul Amin Tuhin, Sr. Lecturer, CSE Department
Full Marks: 30 (15 will be counted towards final grading)
Examination Time: 1 hour and 20 minutes
Uploading time: +15 minutes

Note: There are **SEVEN** questions, answer ALL of them. Course Outcome (CO), Cognitive level and Mark of each question are mentioned at the right margin.

Generate the question: Click on "Enable editing" first at the top yellow bar, then enter your Student ID (10 digits, in the displayed format) in the Green cell at the top of this page and save the file as PDF.

Submission Method: Upload the question as PDF (with your student ID), and one PDF file for answer (total two PDF files) via the Final Exam Assignment in Google Classroom.

Late submission policy: There will be no penalty if submitted within the 15 minutes uploading time. However, for every additional 5-minute delays in submission, 20% marks will be deducted.

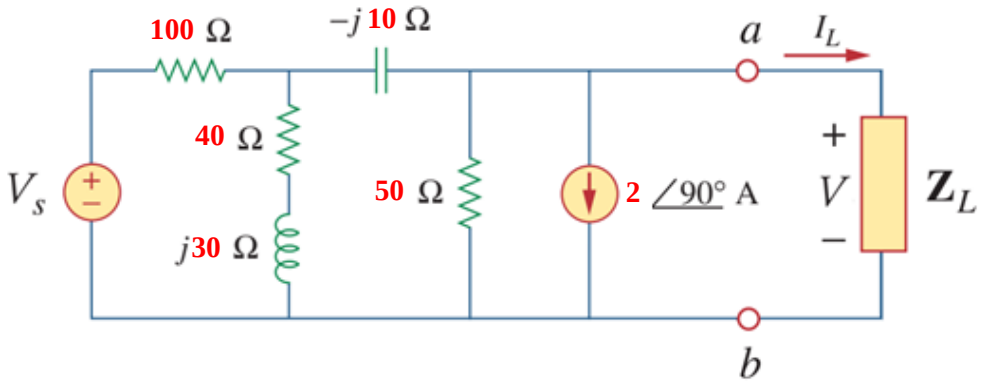

Figure 1

$$v_s(t) = 120\sin(3\pi t - 3570°)\ V$$

Q1. **Find** the *Norton Equivalent* of the circuit given in Figure 1. Determine the value of $\mathbf{Z_L}$ that will draw maximum average power from the circuit. **Calculate** the *maximum average-power* transferred to the load $\mathbf{Z_L}$. **[CO3,C4, Mark: 08]**

Q2. If the load is purely resistive ($\mathbf{R_L}$ instead of $\mathbf{Z_L}$), **determine** the value of the load resistaor $\mathbf{R_L}$ across terminals **a** and **b** for maximum average-power transfer. **[CO3,C4, Mark:02]**

Q3. For both cases of $\mathbf{Z_L}$ and $\mathbf{R_L}$ (for maximum average-power transfer), **calculate** the *effective value* of the load current $\mathbf{I_L}$. Are they same? Explain why or why not. **[CO3,C4, Mark:02]**

Q4. For the load impedance $\boldsymbol{Z_L}$ **(**that will draw maximum average-power), **calculate** the following terms: **[CO3,C4, Mark:08]**

(a) *voltage* ***v(t)*** *across* $\boldsymbol{Z_L}$
(b) *Instantaneous Power and Average Power*
(c) *Apparent Power and Power Factor*
(d) *Complex Power, Real Power and Reactive Power*

Q5. **Convert** the load current $\mathbf{I_L}$ (calculated in Q3) to sinusoidal form $\boldsymbol{i_L(t)}$. If ***v(t)*** is the voltage across the load $\mathbf{Z_L}$ and $\boldsymbol{i_L(t)}$ is the current through the load $\mathbf{Z_L}$, **determine** which sinusoid is *leading* and **calculate** the phase angle. **Comment** whether that load is *capacitive* or *inductive*. **[CO1,C2, Mark:05]**

Q6. **Determine** the element values of all the given reactive elements for the circuit in Figure 1. **[CO1,C2, Mark:02]**

Q7. Suppose you want to make the *susceptance* of the load infinity by connecting a passive element in series with the load. **Determine** the element value of the passive element (in Ohm/Farad/Henry). **[CO1,C4, Mark:03]**