Department of Electronics and Electrical Engineering

EE101, Quiz 5 Timings: 9:00 – 10:30 AM

13 February 2021

Duration: 90 minutes

Total Marks:24

Instructions:

All Questions are to be answered

Enter the solutions up to two decimal points.

Units and signs have to be mentioned with the answers.

Evaluation will be based on the submitted answer sheets only.

Start a new question on a fresh page

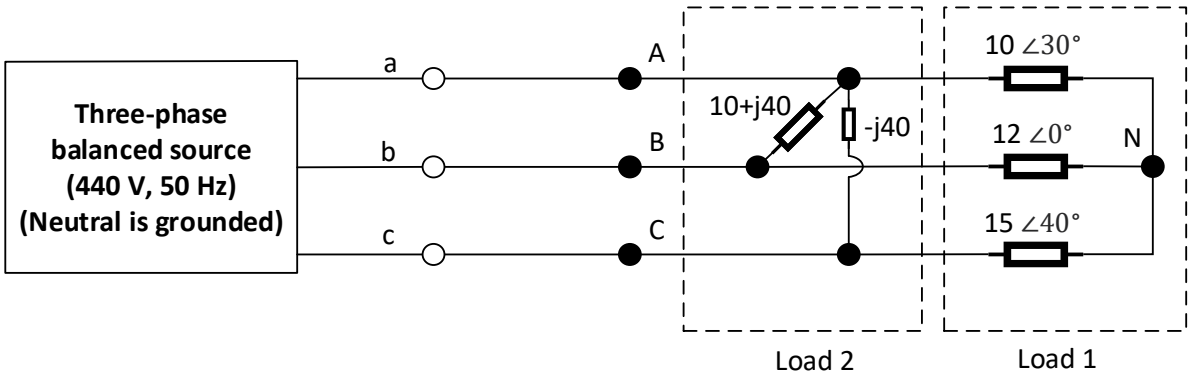
Answer all part of the question together, failing which the answers of that question won't be evaluated.

On every page of the answer sheet, students must mention their name, roll number. Page number should also be mentioned at the top right corner of the answer sheet.

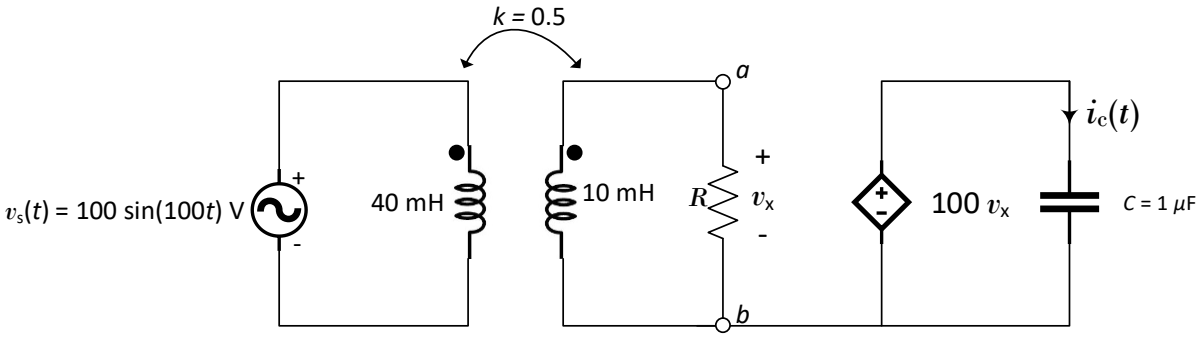
Q1. The circuit as shown below is excited by a balanced three-phase source with a line voltage of 440V. **[6]**

a) Determine the complex power absorbed by load 1, load 2 and the power factor at which source is operating.
b) Calculate the source line currents and draw the phasor diagram considering V_{an} as the reference phasor.
c) A Δ-connected capacitor bank is now connected across the source to compensate the reactive power drawn from the source such that the source will operate at unit power factor. Find the per-phase capacitance of the capacitor bank.

Neglect the impedance of the line and consider the positive phase sequence for the analysis.



Q2. In the circuit given below, a resistor '*R*' is connected across the terminal '*ab*'. Find the capacitor current $i_c(t)$ and the energy stored in the magnetically coupled circuit at t = 5 ms if (a) $R = \infty$ and (b) $R = 1\ \Omega$. **[6]**



Q3. Perform the following conversions: **[2]**

a) $(153.1)_{16} = (?)_{\text{BCD}}$
b) $(153.2)_8 = (?)_{\text{Gray}}$ (keep 3-bit precision)

Q4. The addition equality, $51 + 143 + 33 + 114 = 501$, holds in a number system. Determine the base value of that number system. **[2]**

Q5. A digital system receives a 42-bit data stream corresponding to bi-quinary encoded decimal number as given below: **[2]**

$$\{011100000001001001001110001001001001000010\}$$

Assuming that only one-bit error is possible per digit group, find the locations of digits (from left to right) that are received in error. Also decode the decimal value of the digits that are not received in error.

Q6. Using the QM (tabular) method, find the minimal SOP expression for the Boolean function $F(A, B, C, D) = \Sigma m(0, 2, 4, 5, 10, 11, 13, 15)$. **[2]**

Q7. Given $F(A, B, C) = \Sigma m(3, 5, 15)$ and $F_1(A, B, C) = \Sigma m(1, 3, 4, 5, 7, 8, 12, 13, 14, 15)$. Find the minterm-based SOP expression for $F_2(A, B, C)$ such that $F = (F_1 \cdot \bar{F}_2)$. **[2]**

Q8. Convert the Boolean function $F(A, B, C, D) = A\bar{B} + (B + \bar{A})$ into the POS form. **[2]**