1. a) For the circuit shown in Figure 1, please find its Thevenin equivalent circuit with respect to terminal a-b. [10]
   b) If a (600+j800) Ω load is connected to terminal a-b, please determine the apparent power absorbed by the load. [10]

2. For the RLC network shown in Figure 2 with L=0.2H, R=20Ω, and C=2.5mF, if the input voltage source is given as:
$v_s(t) = 25\text{V}$ for $t < 0$ and $v_s(t) = 10\text{V}$ for $t \geq 0$.
a) Draw the s-domain circuit with initial-value sources for $t \geq 0$. [10]
b) Determine the resonant frequency of the RLC network. [5]
c) Determine the inductor current $i_L(t)$ for $t \geq 0$. [15]

3. A low-pass filter shown in Figure 3 has a cut-off frequency of 2 kHz.
a) Determine the capacitance value C if the resistor R= 6k Ω is selected. [10]
b) For the C value determined in a), if the input signal is $v_{in}(t) = 24\sin(80000\pi t)$ V, please determine the output voltage $v_{out}(t)$= ?. [10]

4. An induction motor is connected to a 60Hz ac source via a (0.2+j0.1) Ω transmission line as shown in Figure 4. The induction motor's voltage is 240 Vrms and consumes 50 kW with power factor 0.8 lagging.
a) Determine the apparent power supplied by the ac source. [10]
b) Determine the capacitance, C, that can be connected in parallel to the induction motor to improve the load terminal power factor to 1 (unity). [10]
c) Determine the currents provide by the ac source before and after the capacitor C is parallel-connected to the induction motor. [10]

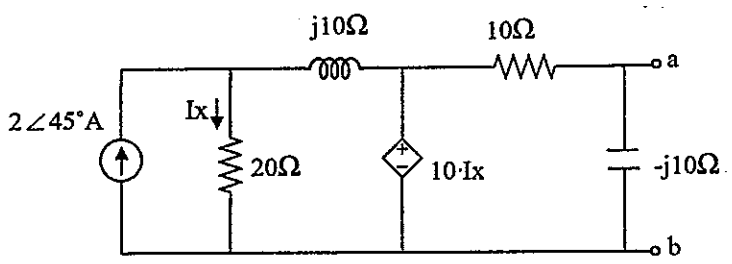

Figure 1

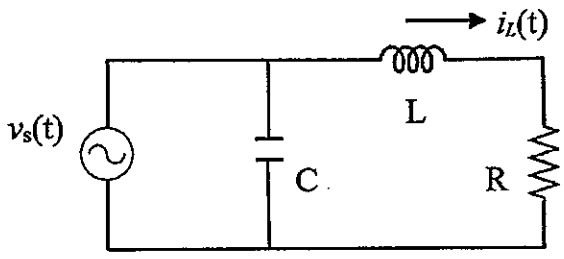

Figure 2

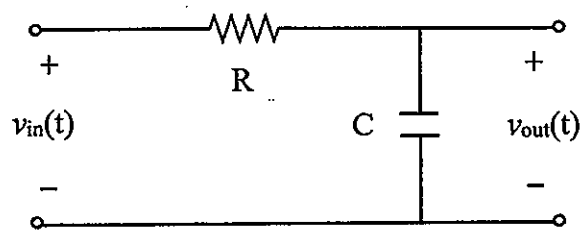

Figure 3

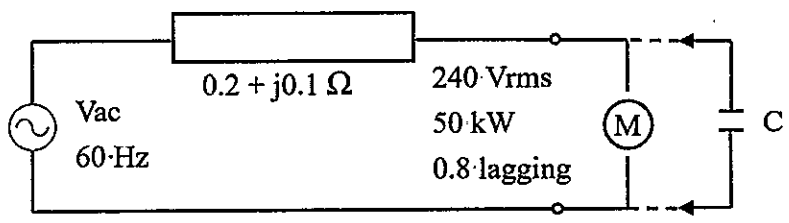

Figure 4

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