(1). (15%) Determine the Thévenin equivalent circuit with respect to terminals α and β in the following circuit. If a resistive load R is also connected to terminals α and β, then what is the maximum power that can be transferred to R?

(2). (10%) Determine current i and voltage v_p for the circuit shown below.
(3). (10%, 2% each) right (O) and wrong (X). 1% will be deducted when the answer is not correct.

(a) It is possible that a sinusoidal input signal sent into a linear circuit generates a non-sinusoidal output signal.
(b) It is possible that a non-sinusoidal input signal sent into a linear circuit generates a sinusoidal output signal.
(c) The unit impulse function is an even function and it is equal to the derivative of the unit step function.
(d) The signals, cos(2πt) and sin(4πt + 30°), are not orthogonal.
(e) The capacitance voltage must be continuous.

(4). (15%) For the following circuit with \( R = 6 \, \Omega, \, L = 5 \, \text{H}, \) and \( C = 1/30 \, \text{F}, \) for \( t > 0, \)
(a) find the particular response of \( v(t) \), when \( v_a(t) = 10u(t) \, \text{V} \) (5%); (b) find the particular response of \( v(t) \), when \( v_a(t) = 10e^{-4}u(t) \, \text{V} \); and (c) find the complete response of \( v(t) \), when \( v_a(t) = 10u(t) \, \text{V}, \, v(0^+) = 20 \, \text{V}, \) and \( i(0^+) = 2 \, \text{A} \) (5%).

(5). (10%) When connected to a 120V, 60 HZ power line, a load absorbs 4KW at a lagging power factor of 0.8. Find the value of parallel capacitance necessary to raise the power factor to 0.95.
(6). (15%) Two wattmeters are properly connected to the unbalanced load supplied by a balanced source such that $V_{ac} = 208 \angle 0^\circ$ V with positive phase sequence.

(a) Determine the reading of each wattmeter.

(b) Calculate the total apparent power absorbed by the load.

\[ Z(s) = \frac{2s + 1}{2s^2 + s + 1} \Omega \]

(a) (5%) What is the frequency response of the circuit at angular frequency $1$ rad/s (in phasor form: $Z\angle \varphi$)?

(b) (5%) Determine the particular response if the network is driven by a current $i(t) = e^{-t} \cos(3t + 10^\circ)$ A.

(8). (15%) For the circuit below,

(a) (10%) determine the mesh currents $I_1$ and $I_2$ (in phasor form), and

(b) (5%) solve for the voltage $v$ across 0.2H inductor.