كلية التقنية الالكترونية
College of Electronic Technology - Tripoli
طرابلس

القســـم....العـــــــــام..... أسئلة الامتحان النهائي لمادة : دوائر كهربية 2

للطلبة الفصل: ...الثاني.... رمز المادة.....EE102 .. ... التاريخ 8 /3 /2020

الفصل الدراس : خريف19- 20..... اسم الأستاذ/المنسق : .....مـــحـــمـــد الشـاوش.... ..الزمن....ســاعـــتان.

اسم الطالب..... رقم القيد ..... المجموعات: .الجميع

Q1)- complete the following **{12 Marks}**

a)- The capcitive circuit has .....power factor, because V .....I .

b)- The frequency is .....

c)- In a series AC circuit given that $v(t)= 30\cos(377t - 20^0)$, and $i(t)= 5\sin(377t + 20^\circ)$, then the type and value element or elements are ....

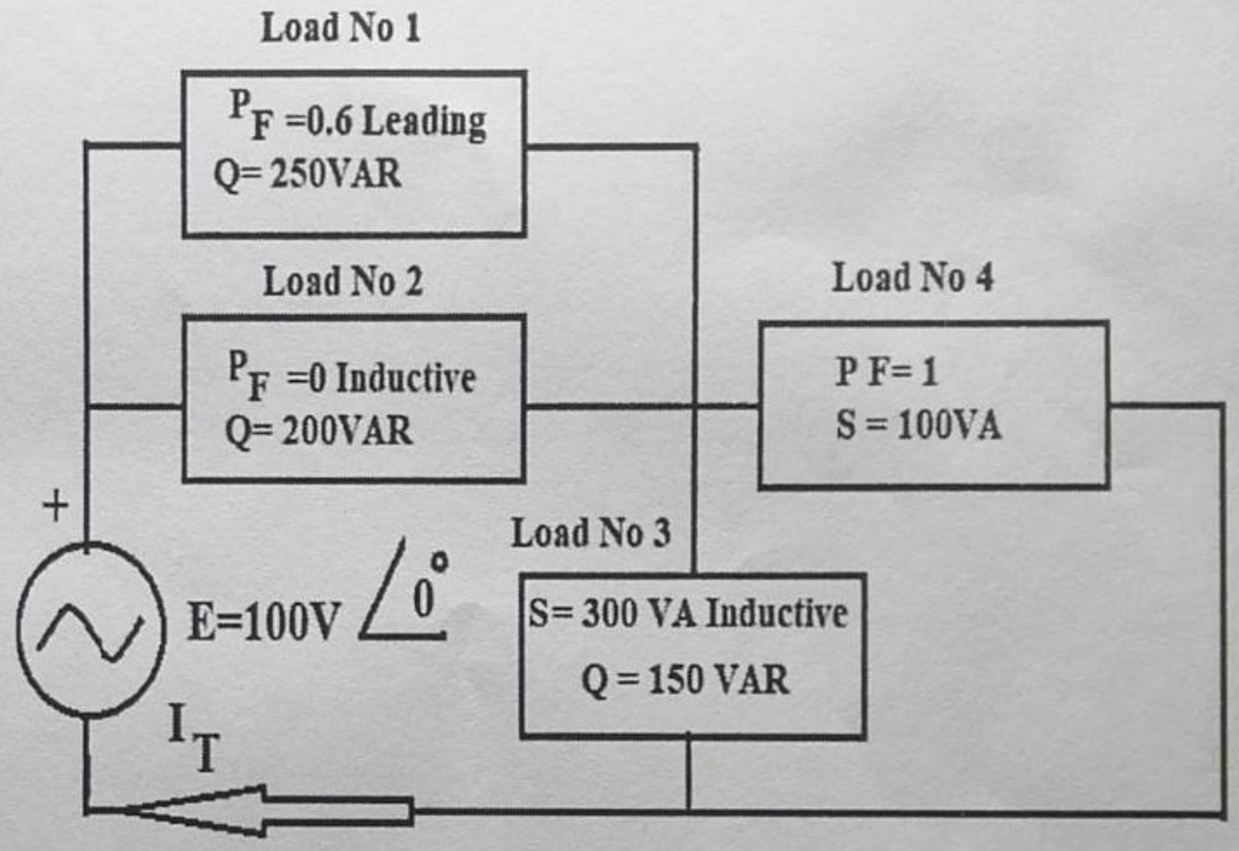
d)- Two parallel impedances $Z_1=4 + j6$ and $Z_2= 2 - j3$, then $Y_T =$ .....(S).

Q2)- For the system shown**{15 Marks}**

1- Draw the power triangle

2- Determine the total current.

3- Determine the total power factor.

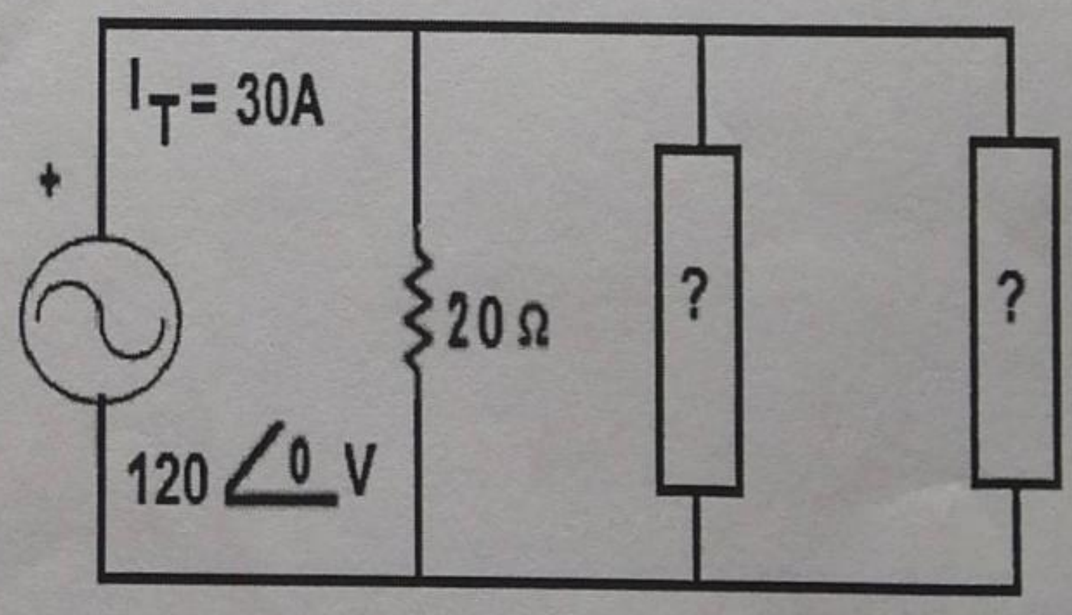


Q3)- in the circuit shown, **{12 Marks}**

In the circuit shown, given that the average power dissipated is 3000W, and the circuit has lagging P_f . Find

1- The natural and magnitude of the parallel elements.

2- Find P_{av}



تمنياتنا للجميع بالتوفيق
أساتذة المادة

انظر خلف الصفحة بقية الأسئلة

القسـم....العـــام..... أسئلة الامتحان النهائي لمادة : دوائر كهربية 2

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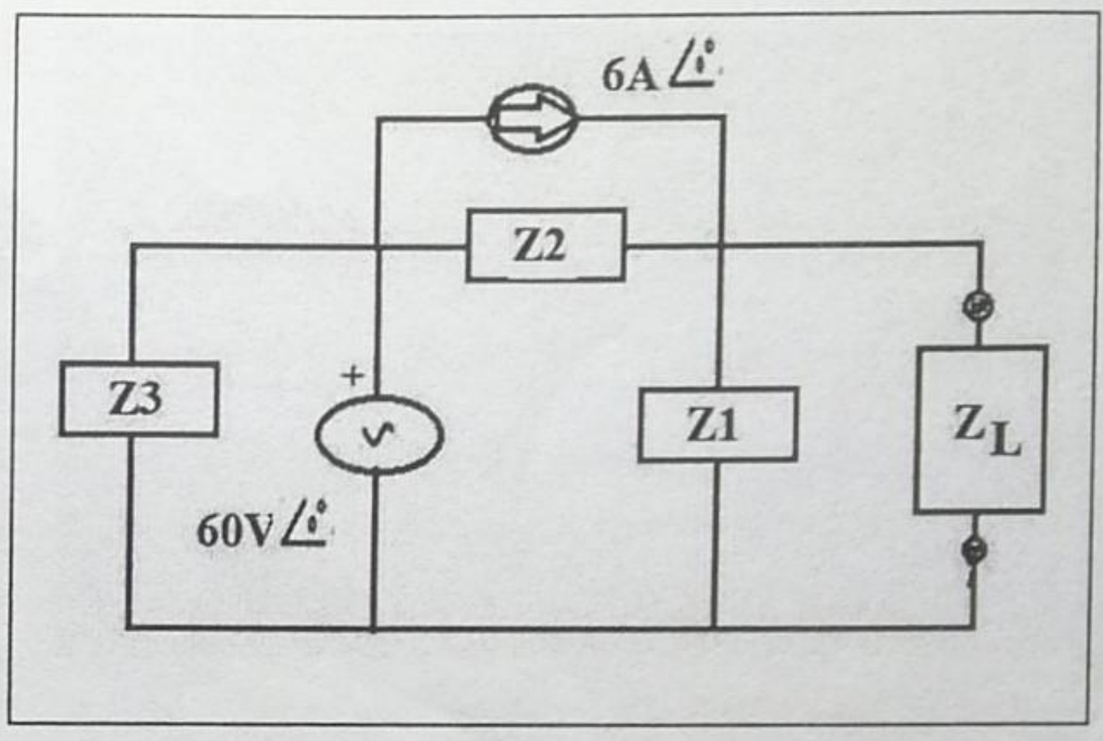
Q4)- For the circuit shown in the figure. **{12 Marks}**

Z1=5 Ω , Z2= 3-J4,

Z3= 2+J2

Determine the value of Z_L for maximum power to the Load, and find $P_{max.}$



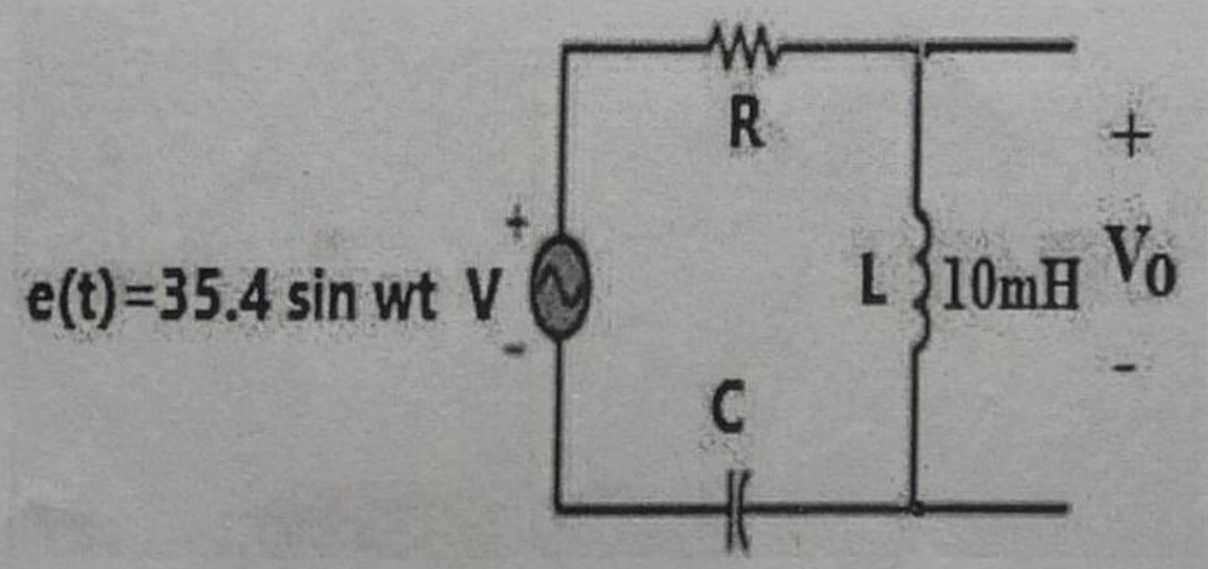
Q5)- In the cricuit shown **{9 Marks}**

(a). Calculate the values of *R* and *C* for the circuit shown in the fig to have a resonant frequency
of 200 kHz and a bandwidth of 20 kHz

(b). Use the designed component values to determine the power dissipated by the circuit at resonance.

(c). Solve for V_0 at resonance.

(d) - Find the quality factor Qs.



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نموذج الإجابة كهربائية ∥ (6) ص ∴ حورية الجزار

السؤال الأول : 12 (الدرجة)

a) Leading Pf, V lags I. (3)

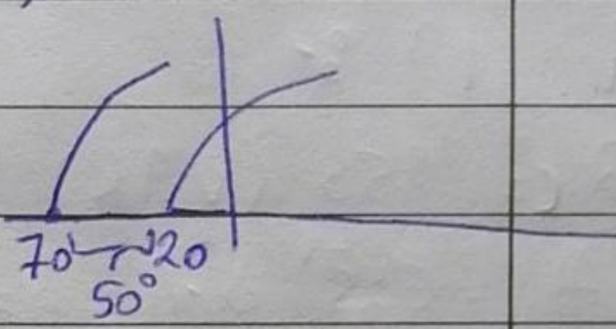
b) The frequency is the number of cycles per second (3)
التردد هو عدد الدورات في الثانية الواحدة

c) $v(t) = 30 \sin(377t - 20 + 90)$

$v(t) = 30 \sin(377t + 70)$

$i(t) = 5 \sin(377t + 20)$

v leads i by 50°



$$\therefore z = \frac{30 \angle 70}{5 \angle 20} = 6 \angle 50^\circ (\Omega) = 3.86 + j4.6\ \Omega$$

$R = 3.86\ \Omega$, $X_L = 4.6\ \Omega$ (3)

d) $Z_1 = 4 + j6\ \Omega \Rightarrow Y_1 = 0.0771 - j0.116$ S

$Z_2 = 2 - j3\ \Omega \Rightarrow Y_2 = 0.154 + j0.231$ S

$Y_T = 0.231 + j0.115$

$= 0.258 \angle 26.47^\circ$ S (3)

السؤال الثانى (15 الدرجة)

load	P(W)	Q (VAR)	S (VA)	Pf
1	187.5W	-250	312.5	0.6 L
2	0	+200	200	0 ملف
3	259.8	+150	300	0.86 ملف
4	100	0	100	1
Total	547.8 (1)	+3100 (2)		

load (1) :-

$Q_c = 250$ (VAR)

$\theta = \cos^{-1} 0.6 = 53.13^\circ$

$\tan\theta = \frac{Q_c}{P_1} \Longrightarrow P_1 = \frac{Q_c}{\tan\theta} = \frac{250}{\tan 53.13} = 187.5\,W$

$S_1 = \sqrt{(250)^2 + (187.5)^2} = 312.5\,VA$ (1)

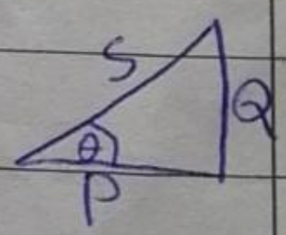
load (2) :- $P_f = 0$ $\&$ $Q = 200$, $S = 200$

$P = 0$ (1)

load (3) :- $S = 300\,VA$, $Q = 150$ (L) ,

$P = \sqrt{(300)^2 - (150)^2} = 259.8$

$\sin\theta = \frac{\text{المقابل}}{\text{الوتر}} = \frac{Q}{S} = \frac{150}{300} = \frac{1}{2}$ (1)



$\therefore \theta = \cos^{-1}(0.5) = 30^\circ$ & $P_f = \cos 30 = 0.86$

load (4) :- $P_f = 1$, $S = 100\,VA$, $P = 100 \times 1 = 100\,W$ (1)

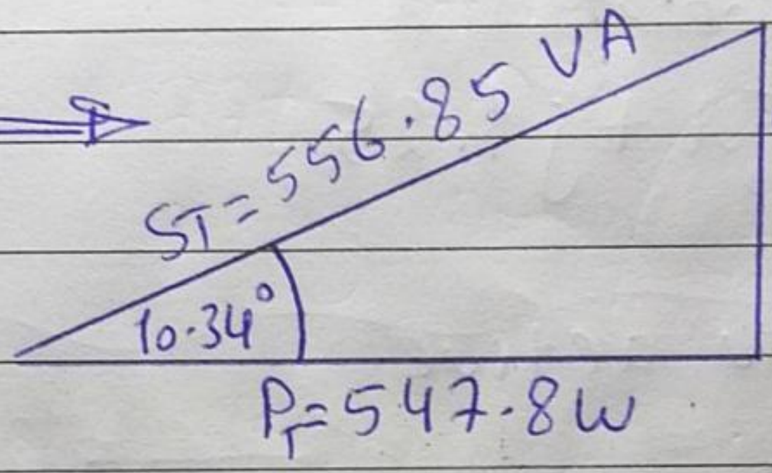
$S = P \pm Q$ (2)

$= 547.8 + 100VA = 556.85 \angle 10.34°$ (VA)

$I_T = \frac{S}{E} = \frac{556.85\ VA}{100\ V} = 5.568\ A$ (2)

$P_f = \frac{P_T}{S_T} = \frac{547.8}{556.85} = 0.983$ laging (2)

Power triangle ⟹



(2)

السؤال الثالث: الدرجة (12)

$\because P_{avr} = 3000$, $E = 120V\angle 0°$, $I = 30A\angle ?$

$\therefore P_{av} = E I \cos\theta$

$P_f = \cos\theta = \frac{P_{avr}}{E I} = \frac{3000}{120(30)} = 0.833$

$\therefore P_f = 0.833$ $\therefore \theta_T = \cos^{-1}(0.833)$

$= 33.56°$ lagging (1)

$\therefore I_T = 30A\angle -33.56°$ (1)

$Y_T = \frac{I_T}{E} = \frac{30A\angle -33.56}{120V\angle 0} = 0.25\ S\angle -33.56$ (2)

$Y_T = 0.2083 - j0.138\ S$

$G_1 = \frac{1}{R_1} = \frac{1}{20\Omega} = 0.05\ S$

$G_2 = 0.2083 - 0.05 = 0.1583\ S$ $\therefore R_2 = \frac{1}{0.1583} = 6.32\ \Omega$ (3)

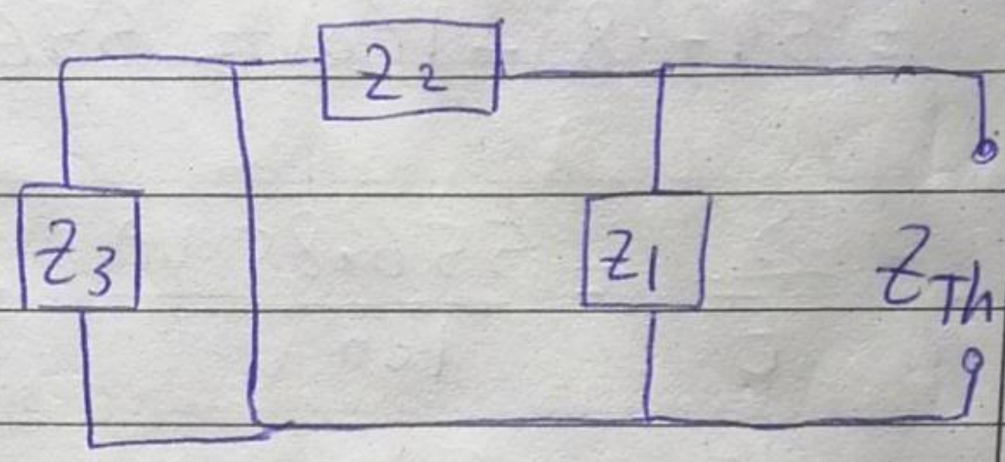
$X_L = \frac{1}{0.138} = 7.24\ \Omega$ (3)

$P_{av} = 3000$ watt (2)

السؤال الرابع (12 الدرجة)

$Z_1 = 5\angle 0$, $Z_2 = 3 - j4$, $Z_3 = 2 + j2 = 2.83\Omega \angle 45°\Omega$

Z_3 S/C نلغي



$Z_{Th} = Z_1 // Z_2$

$Z_{Th} = \frac{(5\angle 0)(5\angle -53.13)}{8 - j4}$

$Z_{Th} = \frac{25\angle -33.13°\ \Omega}{8.94\angle -26.57} = 2.5\Omega - j1.25\Omega$ (2)

$Z_L = 2.5\Omega + j1.25$ (2)

المجموع (4)

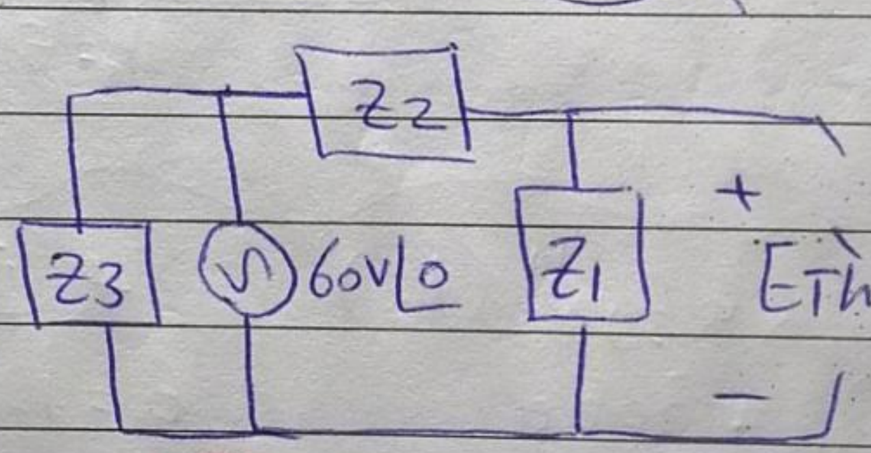
E_{Th} ⇒ 60V active

$\therefore E_{Th}' = V_{Z_1}$

$E_{Th}' = \frac{60V\angle 0\ (5\angle 53.13)}{8.94\angle -26.57}$

$= 33.56v\angle -26.57°$

$= 30 + j15\ v$ (+ −)



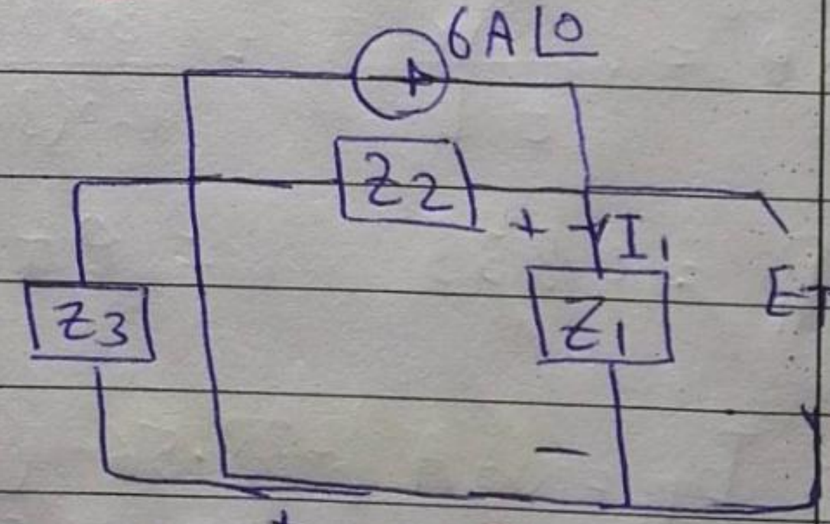
(2)

E_{Th}'' ⇒ 6A active

$E_{Th}'' = I_1 Z_1$

using CDR

$E_{Th}'' = \frac{6A\angle 0 * 5\angle -53.13}{8.94\angle -26.5} * (5\angle 0)$



$= 16.78\angle -26.56 = 15 - j7.5\ v$ (+ −) (2)

$E_{Th} = E_{Th}' + E_{Th}'' = (30 + 15j) + (15 - 7.5j)$

$= 45 + 7.5j = 45.6\angle 9.46°\ v$ (2)

$P_{max} = \frac{E_{Th}^2}{4(R_{Th})} = \frac{(45.6)^2}{4(2.5)} = 207.93\ watt$ (2)

السؤال الخامس : 9 درجات

Given $f_s = 200\,kHz$

$BW = 20\,kHz$

a) $X_L = \omega L = (2\pi f_s) L = 2\pi (200\,kHz)(10\,mH)$

$= 1256\,\Omega$

$Q_s = \frac{f_s}{BW} = \frac{200\,kHz}{20\,kHz} = 10$

$Q_s = \frac{X_L}{R} \Longrightarrow R = \frac{X_L}{Q_s} = \frac{1256\,\Omega}{10} = 1256\,\Omega$ (1.5)

$X_L = X_C = 1256\,\Omega$

$X_C = \frac{1}{\omega C} \Rightarrow C = \frac{1}{\omega_s X_C} = \frac{1}{2\pi (200\,kHz)(1256)}$

$C = 0.0634\,nf$ (1.5)

b) $P = \frac{E^2}{R} = \frac{(35.4/\sqrt{2})^2}{1256} = \frac{(25)^2}{1256} = 0.5\ watt$ (2)

c) $V_o = V_{XL} = Q_s E$

$= 10 \left(\frac{35.5}{\sqrt{2}}\right) = 250\,V$ (2)

d) $Q_s = \frac{f_s}{BW} = \frac{200\,kHz}{20\,kHz} = 10$ (2)

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Nouria