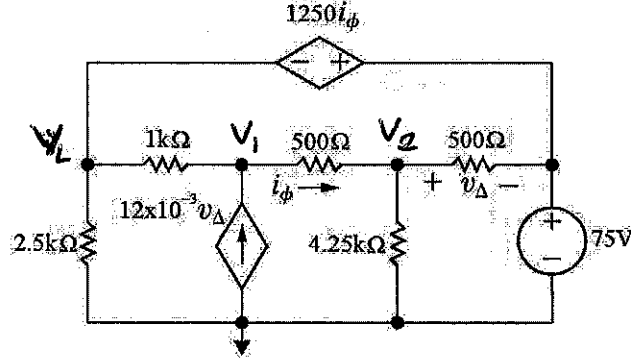


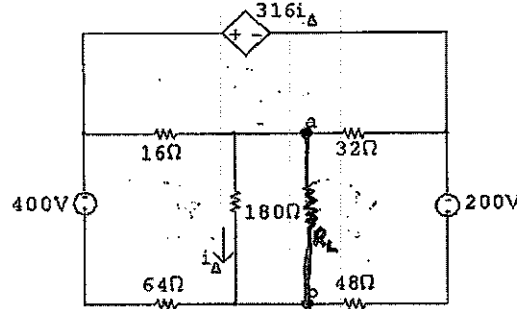
2014-2015 EEM-201 DEVRE TEORİSİ GÜZ YARIYILI FİNAL SINAVI

Adı Soyadı:		1 (25)	2 (25)	3 (25)	4 (25)	Toplam (100)
Numara:						

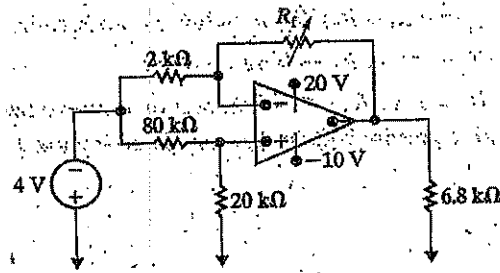
1. Aşağıdaki devrede V_Δ gerilim değerini düğüm gerilimleri yöntemini kullanarak hesaplayınız.



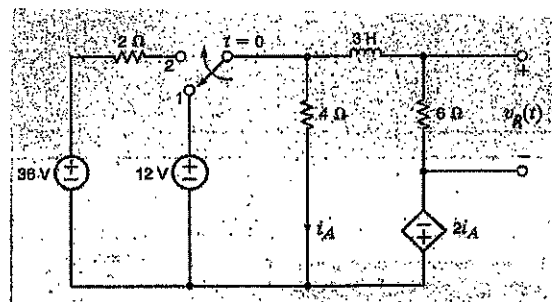
2. Aşağıdaki devrede yük direnci R_L 'ye maksimum güç aktarılması için R_L 'nin değeri ne olmalıdır hesaplayınız.



3. Aşağıdaki devrede görülen işlemsel yükselteç devresinde R_f direnci işlemsel yükselteç doyuma ulaşacak şekilde ayarlanmıştır. R_f direncinin değerini hesaplayınız.



4. Aşağıdaki devrede anahtar 1 konumunda kalıcı duruma eriştikten sonra $t=0$ anında anahtar konum 1'den konum 2'ye getirilmiştir. $t \geq 0^+$ için $V_R(t)$ 'yi bulunuz.



$$\textcircled{1} - \frac{V_1 - V_L}{1000} - \frac{12V_\Delta}{1000} + \frac{V_1 - V_2}{500} = 0 \quad \textcircled{5}$$

$$V_1 - V_L - 12V_\Delta + 2V_1 - 2V_2 = 0$$

$$3V_1 - V_L - 12V_\Delta - 2V_2 = 0 \quad \leftarrow$$

$$V_L = 75 - 1250 I_\phi$$

$$V_L = 75 - 1250 \left(\frac{V_1 - V_2}{500} \right)$$

$$V_L = 75 - 2,5V_1 + 2,5V_2$$

$$V_\Delta = V_2 - 75 \quad \textcircled{5}$$

$$3V_1 - 75 + 2,5V_1 - 2,5V_2 - 12V_2 + 900 - 2V_2 = 0$$

$$5,5V_1 - 16,5V_2 = -825$$

$$16,5V_2 - 5,5V_1 = 825 \quad \textcircled{5}$$

(2). düğüm

$$\frac{V_2}{\frac{4250}{850} \quad (10)} + \frac{V_2 - V_1}{\frac{500}{100} \quad (85)} + \frac{V_2 - 75}{\frac{500}{100} \quad (85)} = 0 \quad \textcircled{5}$$

$$10V_2 + 85V_2 - 85V_1 + 85V_2 - 6375 = 0$$

$$180V_2 - 85V_1 = 6375$$

$$16,5V_2 - 5,5V_1 = 825$$

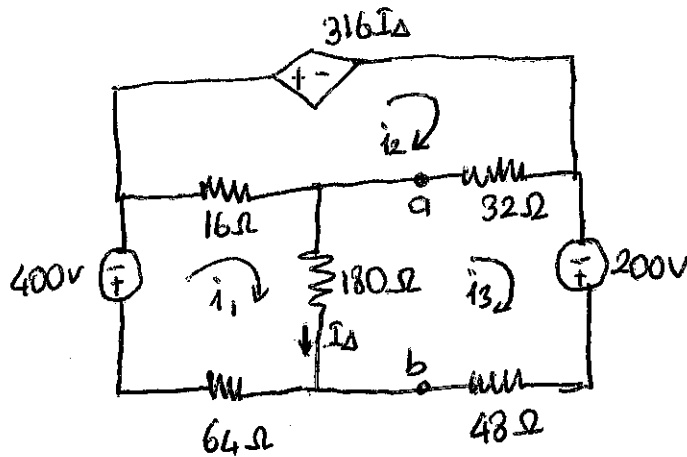
$$180V_2 - 85V_1 = 6375$$

$$V_1 = 105 \text{ V}$$

$$V_2 = 85 \text{ V} \quad \textcircled{5}$$

$$V_\Delta = V_2 - 75 = 85 - 75 = 10 \text{ V}$$

②. Açık devre gerilimi V_{th}



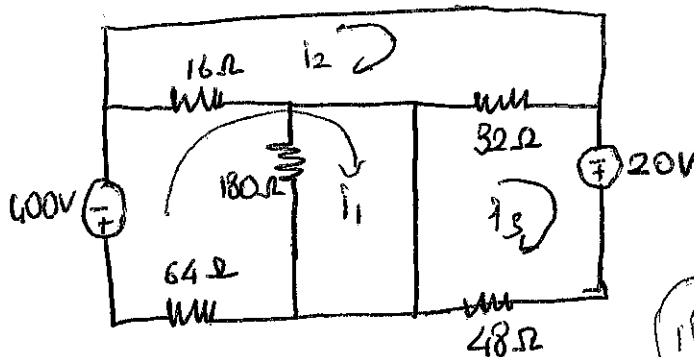
$$260I_1 - 16I_2 - 180I_3 = -400$$

$$-16I_1 + 48I_2 - 32I_3 + 316(I_1 - I_3) = 0$$

$$-180I_1 - 32I_2 + 260I_3 = 200$$

$$I_1 = 3A \quad I_2 = 17,5A \quad I_3 = 5A \quad I_{\Delta} = I_1 - I_3 = -2A$$

$$V_{th} = 180I_{\Delta} = -360V$$



$$I_{\Delta} = 0$$

$$316I_{\Delta} = 0$$

$$80I_1 - 16I_2 = -400$$

$$-16I_1 + 48I_2 + 32I_3 = 0$$

$$-32I_2 + 80I_3 = 200$$

$$I_1 = -5A$$

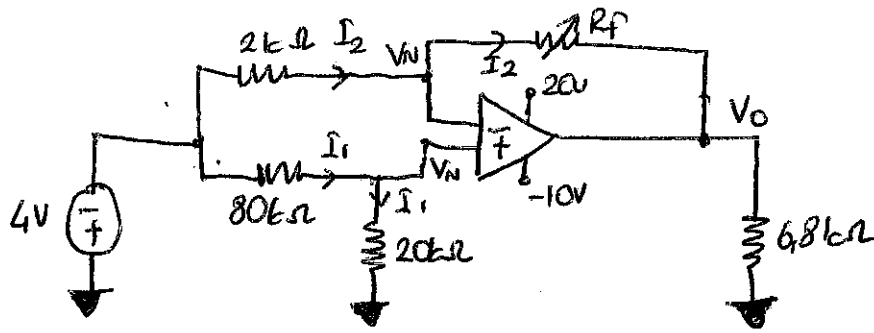
$$I_2 = 0A$$

$$I_3 = 2,5A$$

$$I_N = I_1 - I_3 = -7,5A$$

$$R_{th} = \frac{V_{th}}{I_N} = \frac{-360}{-7,5} = 48\Omega$$

③ -



$$\textcircled{5} \quad \frac{-4 - V_N}{80k} = \frac{V_N}{20k}$$

$$-4 - V_N = 4V_N$$

$$5V_N = -4$$

$$V_N = -\frac{4}{5} V$$

$$V_O = -10V \text{ i\u00e7in}$$

$$\frac{-4 + \frac{4}{5}}{2k} = \frac{-\frac{4}{5} + 10}{R_f}$$

$$-16R_f = 2 \cdot 10^3 46$$

$$\boxed{R_f = -5,75 k\Omega} \rightarrow (-) \text{ okulu i\u00e7in alınmaz}$$

$$\frac{-4 - V_N}{2k} = \frac{V_N - V_O}{R_f} \textcircled{5}$$

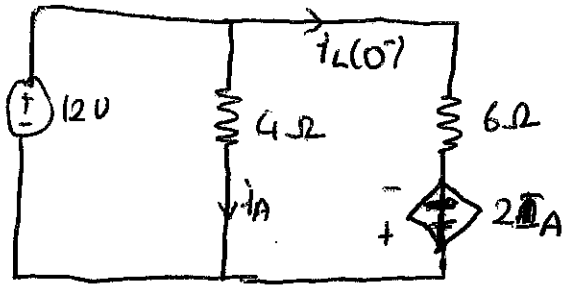
$$V_O = 20V \text{ i\u00e7in}$$

$$\frac{-4 + \frac{4}{5}}{2k} = \frac{-\frac{4}{5} - 20}{R_f} \textcircled{5}$$

$$\frac{-168}{2k} = \frac{-104}{R_f}$$

$$\boxed{R_f = 13k\Omega} \textcircled{5}$$

④- $i_L(0^-)$ yi hesaplamak için anahtar 1 konumunda



$$I_A = \frac{12}{4} = 3A$$

$$12 = 6I_L(0^-) - 2I_A$$

$$12 = 6I_L(0^-) - 6$$

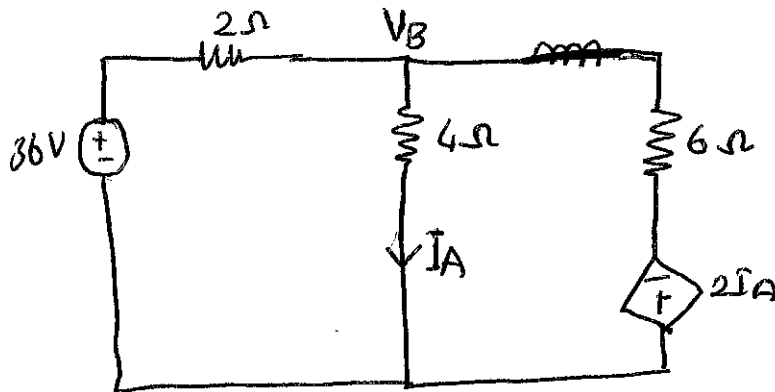
$$18 = 6I_L(0^-)$$

$$I_L(0^-) = 3A$$

$$I_L(0^-) = I_L(0^+) = I_L(0) = 3A$$

$$V_R(0^+) = 3 \cdot 6 = 18V \quad (5)$$

$V_R(\infty)$ bulmak için anahtar 2 konumunda kalıcı durum



$$\frac{V_B - 36}{2} + \frac{V_B}{4} + \frac{V_B + 2I_A}{6} = 0$$

(6) (3) (2)

$$2I_A = 2 \cdot \frac{V_B}{4} = \frac{V_B}{2}$$

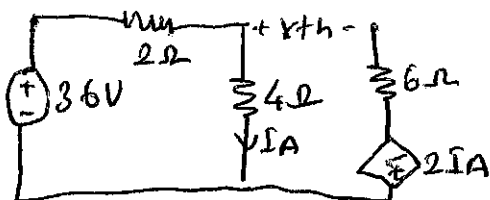
$$6V_B - 216 + 3V_B + 2V_B + V_B = 0$$

$$12V_B = 216$$

$$V_B = 18V$$

$$V_R(\infty) = V_B + 2I_A = 18 + 9 = 27V \quad (5)$$

τ zaman sabiti için R_{th} hesaplanmalı V_{th} ve I_N hesaplanmalı



$$I_A = \frac{36}{6} = 6A$$

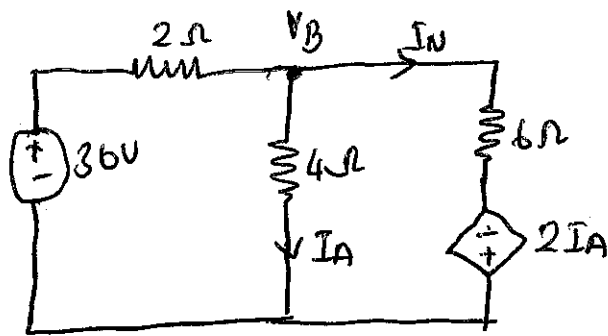
$$V_{4\Omega} = 24V$$

$$2I_A = 12V$$

$$V_{th} = V_{4\Omega} + 2I_A$$

$$V_{th} = 36V \quad (5)$$

4 devamı



$$\frac{V_B - 36}{2} + \frac{V_B}{4} + \frac{V_B + 2I_A}{6} = 0$$

$$V_B = 18 \text{ V}$$

$$I_N = \frac{V_B + 2I_A}{6} = \frac{18 + 9}{6} = \frac{9}{2} \text{ A}$$

$$R_{th} = \frac{V_{th}}{I_N} = \frac{36}{\frac{9}{2}} = 8 \Omega \quad (5)$$

$$\tau = \frac{L}{R_{th}} = \frac{3}{8} \text{ s} \quad (6)$$

$$V(t) = 27 + (18 - 27) e^{-\frac{t}{3/8}} = 27 - 9e^{-\frac{8}{3}t} = 27 - 9e^{-2.66t} \quad (5)$$