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"Elektrijada 2012, oblast II, zadatak 1, maj 2012";
"uL1(t)=162sin(ωt+π/4)+117√2 sin3ωt V.";
"i(t)=Ieff1√2 sin(ωt+ψ1) A.";
"u(t)=162√2 sinωt+Ueff3√2 sin(3ωt+θ3)";
"Odrediti XC1,i(t),XC2,u(t)";
R =  $\frac{81}{8}$ ;
R1 = 8;
XL1 = 9;
XL2 = 16;
XM = 9;
"Uvedimo oznake za fazore pojedinih harmonika, UL1n,IIn,Un,IR1n i nepoznate";
"reaktanse za osnovnu kruznu ucestanost ω: XC1, XC2";
"Prema datim podacima poznati su fazori:";
Print["UL11 = ", UL11 = 81*(1 + I), " V, UL13 = ", UL13 = 117, " V."]
Print["U1 = ", U1 = 162, " V, I13 = ", I13 = 0, " A."]
"Fazor struje kroz kondenzator C1, smer odozgo prema dole, i fazor struje kroz";
"kondenzator C2, smer odozgo prema dole, bice:";
Print["IC1n = ", IC1n = I *  $\frac{n * UL1n}{XC1}$ , ", IC2n = ", IC2n = IIn - IR1n, "."]
"Fazor struje kroz induktivitet L1, smer odozgo prema dole, bice:";
Print["IL1n = ", IL1n = IR1n - I *  $\frac{n * UL1n}{XC1}$ , "."]
UL11 = 81 + 81 i V, UL13 = 117 V.
U1 = 162 V, I13 = 0 A.
IC1n =  $\frac{i n UL1n}{XC1}$ , IC2n = IIn - IR1n.
IL1n = IR1n -  $\frac{i n UL1n}{XC1}$ .
"Pisemo dve jednačine, prva - ravnoteza napona po konturi koju cini";
"srednja i desna grana, druga - relacija za napon na induktivitetu L1.";
"Iz ove dve jednačine izracunavamo fazore odgovarajucih harmonika";
"struja In i IR1n";
Rez = Flatten[Solve[{
    I *  $\left(n * XL2 - \frac{XC2}{n}\right) * (IIn - IR1n) + I * n * XM * \left(IR1n + \frac{n * UL1n}{I * XC1}\right)$ 
    == R1 * IR1n + UL1n,
    UL1n == I * n * XL1 *  $\left(IR1n + \frac{n * UL1n}{I * XC1}\right) + I * n * XM * (IIn - IR1n)$ 
}, {IIn, IR1n}]];
Print["IIn = ", IIn = IIn /. Rez, ", "]
Print["IR1n = ", IR1n = IR1n /. Rez, "."]
IIn =  $\frac{i (9 n^2 UL1n - UL1n XC1)}{9 n XC1}$ ,

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IR1n = 
$$\frac{i (63 n^4 UL1n - 7 n^2 UL1n XC1 - 9 n^2 UL1n XC2 + UL1n XC1 XC2)}{9 n XC1 (-8 i n + 7 n^2 - XC2)}.$$

"Za k=3 racunamo:";
Print["II3 = ", II3= Simplify[(II1n /. Rez) /. {n→ 3, UL1n→ UL13}], " A."]
II3 = 
$$-\frac{13 i (-81 + XC1)}{3 XC1} A.$$

"Iz uslova II3=0 sledi:";
Print["XC1 = ", XC1 = 81, " Ω."]
XC1 = 81 Ω.
Print["IR13 = ", IR13= Simplify[(IR1n /. Rez) /. {n→ 3, UL1n→ UL13}], " A."]
IR13 = 0 A.
Print["U3 = ", U3 = R1 * IR13 + UL13 + R * II3, " V."]
U3 = 117 V.
Print["u3(t) = ", U3, " $\sqrt{2} \sin(3\omega t)$  V."]
u3(t) =  $U3\sqrt{2} \sin(3\omega t)$  V.
"Za n=1";
Print["II1 = ", II1= Simplify[(II1n /. Rez) /. {n→ 1, UL1n→ UL11}], " A."]
II1 =  $8 - 8 i$  A.
Print["i1(t) = ", Abs[II1] *  $\sqrt{2}$ , " $\sin(\omega t - \pi/4)$  A."]
i1(t) =  $16 \sin(\omega t - \pi/4)$  A.
Print["IR11 = ", IR11= Simplify[(IR1n /. Rez) /. {n→ 1, UL1n→ UL11}], " A."]
IR11 = 
$$\frac{(8 - 8 i) (-7 + XC2)}{(-7 + 8 i) + XC2} A.$$

Print["U1 = ", U1 = R1 * IR11 + UL11 + R * II1, " V."]
U1 =  $162 + \frac{(64 - 64 i) (-7 + XC2)}{(-7 + 8 i) + XC2} V.$ 
"Zadato je U1=162 V pa sledi:";
Print["XC2 = ", XC2 = 7, " Ω."]
XC2 = 7 Ω.
"Trazena resenja:"
Print["XC1 = ", XC1, " Ω, i(t) =  $16 \sin(\omega t - \pi/4)$  A, XC2 = ", XC2, " Ω,"]
Print["u(t) =  $162\sqrt{2} \sin \omega t + 117\sqrt{2} \sin 3\omega t$  V."]
Trazena resenja:
XC1 = 81 Ω, i(t) =  $16 \sin(\omega t - \pi/4)$  A, XC2 = 7 Ω,
u(t) =  $162\sqrt{2} \sin \omega t + 117\sqrt{2} \sin 3\omega t$  V.

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