ELEKTRIJADA 2009 – Analiza EES-a

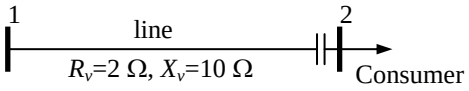
ANNOTATION: You must chose only one of given answers for problems. Right answers worth 1 point. Wrong answers worth –0.25 point. For answers "I don't know" there is no negative points.

1. Line with parameters X_g=10 Ω i R_g≅0 Ω. Is given. Voltage at beginning of line is U_1=110 kV, and power at the end of line is $\underline{S}_2$=(50+j30) MVA. Find voltage at the end of line $\underline{U}_2$. The answer is:
a)
b) $\underline{U}_2 = 107.1e^{-j2.43°}$ kV
c)
d) No one of given answers
e) I don't now

2. Transmission line (Un=220 kV, f_n=50 Hz) with parameters
r_v=0,08 Ω/km,
l_v=1,2 mH/km,
c_v=9,55 nF/km,
L_v=100 km,
is given. Voltage and power at the beginning of line are U_1=220 kV and $\underline{S}_1$=(100+j50) MVA. Using "π" model of line find power losses. The answer is:
a) $\underline{S}_{gub}$=(2.195−j3.35) MVA
b) $\underline{S}_{gub}$=(2.195+j10.343) MVA
c) $\underline{S}_{gub}$=(2.195+j3.35) MVA
d) No one of given answers
e) I don't now

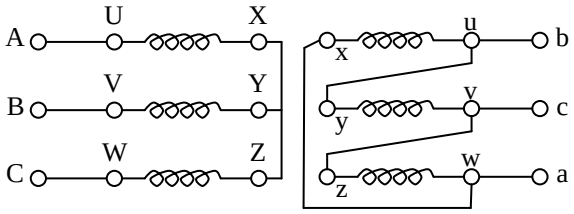
3. Bus A supplied consumption area with constant power $\underline{S}_p$=(6+j4) MVA. Shunt capacitor bank with constant capacitance C=60 μF/phase is connected at bus A. In that case voltage at bus A is U_A=10.3 kV. Find power factor at bus A. The answer is:
a) $\cos\varphi_A$=
b) $\cos\varphi_A$=0.9487
c) $\cos\varphi_A$=
d) No one of given answers
e) I don't now

4. Transmission line, shown on the figure, supply consumption area with $\mathrm{tg}\varphi_p$=0.5. Near bus 2 serial capacitor bank is connected. Find value of serial capacitor bank (X_c) which fully compensated voltage drop from bus 1 to bus 2.



The answer is:
a)
b)
c) X_c=14 Ω
d) No one of given answers
e) I don't now

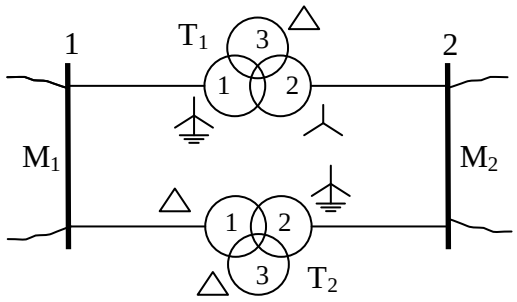
5. For transformer, given at Figure, find phase group.



The answer is:
a) 1
b) 3
c) 5
d) No one of given answers
e) I don't now

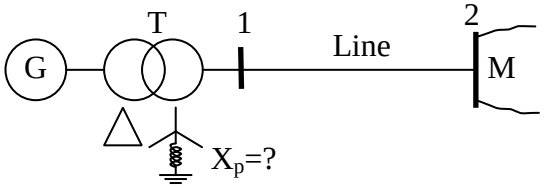
6. Equivalent impedances for all three symmetrical systems at one bus are $\underline{Z}_d$=jX, $\underline{Z}_i$=$\underline{Z}_d$ i $\underline{Z}_o$=jkX. Find three phase fault and single phase to gtound fault current ratio at he bus in function of parameter k. The answer is:
a) $|\underline{I}_{3k}|/|\underline{I}_{1k}|$=
b) $|\underline{I}_{3k}|/|\underline{I}_{1k}|$=(2+k)/3
c) $|\underline{I}_{3k}|/|\underline{I}_{1k}|$=
d) No one of given answers
e) I don't now

7. Two networks M_1 and M_2 are connected via two three wind transformer (see figure). Equivalent zero-sequence reactances for networks are $X_{oM1}=X_{oM2}=0.1$ r.j.. Transformers have same reaktances for corespond windings $X_1=0.3$ r.j., $X_2=0.38$ r.j. and $X_3=0.2$ r.j.. Find equivalent zero-sequence from busses 1 i 2.



The answer is:
a) $\underline{Z}_{o1}^{ekv}=j0.1$ r.j., $\underline{Z}_{o2}^{ekv}=j0.0833$ r.j.
b) $\underline{Z}_{o1}^{ekv}=j0.0833$ r.j., $\underline{Z}_{o2}^{ekv}=j0.0833$ r.j.
c) $\underline{Z}_{o1}^{ekv}=j0.0833$ r.j. $\underline{Z}_{o2}^{ekv}=j0.1$ r.j.
d) No one of given answers
e) I don't now

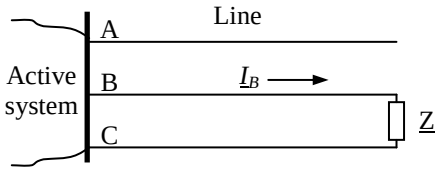
8. Simply power system with data is shown on the figure.



G: $S_{nG}=200$ MVA, $U_{nG}=10.5$ kV, $x_g=20$ %
T: $S_{nT}=S_{nG}$, $m_T=110/10.5$ kV/kV, $x_T=10$ %
V: $x_{dv}=0.4$ Ω/km, $x_{ov}=3\cdot x_{dv}$, $L_v=50$ km
M: Mreža "∞" snage

Find value of reactor (X_p) which limits single phase to ground current at bus 1 at value 5.5 kA. The answer is:
a)
b) $X_p=5.016$ Ω
c)
d) No one of given answers
e) I don't now

9. Active network via three phase transmission line supply consumption $\underline{Z}$ (see figure). Current at phase B is $\underline{I}_B = 3e^{-j120°}$ r.j. Find symmetrical component for transmission line current



The answer is:
a)
b) $\underline{I}_d = \sqrt{3}e^{-j30°}$ r.j., $\underline{I}_i = \sqrt{3}e^{j150°}$ r.j., $\underline{I}_i = 0$ r.j.
c)
d) No one of given answers
e) I don't now

10. In table data for busses in one transmission network (voltage, voltage angle, active and reactive generation and load power) are given. Data are given in p.u.

čv.	U	θ	P_G	P_P	Q_G	Q_P
1	1.05	0	/	1.2	/	1.0
2	/	/	0	1.0	0	0.5
3	1.00	/	2.1	0.8	/	0.4
4	1.02	/	2.4	1.0	/	0.3
5	/	/	0	1.0	0	0.4
6	/	/	0	1.5	0	0.8

Based on given data find dimension of Jacobian matrix in Newton-Raphson method for power flow calculation. The answer is:
a) dim(J)=7x7
b) dim(J)=5x5
c) dim(J)=6x6
d) No one of given answers
e) I don't now