أسئلة سنوات سابقة

تحليل أنظمة قوى I

ابذل غاية الجهد ييسّر لك غاية الهدى
(والذين جاهدوا فينا لنهدينّهم سبلنا)

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Q1. *Complete the following sentences.*

1.Synchronous generators have two synchronously rotating fields:

a) *By the rotor driven at* ..Dc.. *and* ..excitation.. Field winding Field

b) *In the stator windings by the* ..winding..

2.In a power system plant, the size of generators can vary from ...50 to 1500 MW

ANSI *3.ANSA means* ...American National Standard Abitute

4. Load factor is the .....average load / peak load....

rotor — Dc current; stator — Ac current

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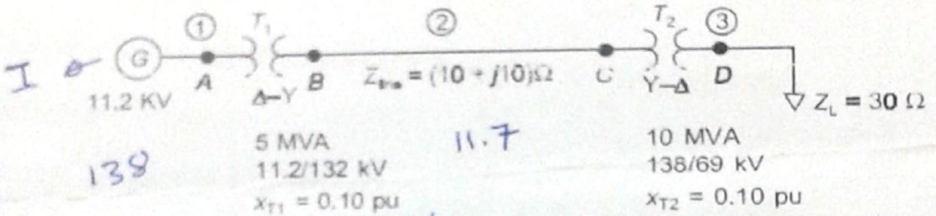
shows a sample power system networks. Find the current supplied by the generator, the transmission line current, the load current, the load voltage and the power consumed by the load.

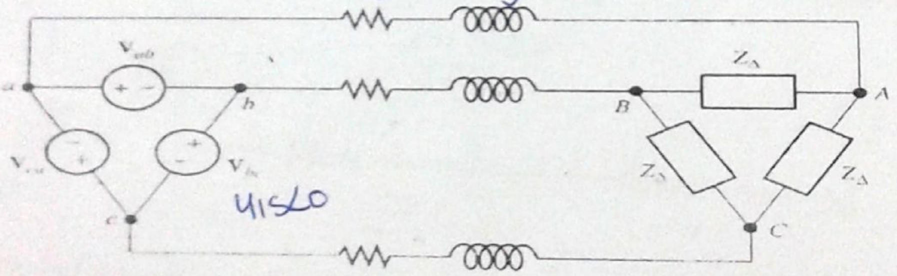


load current

Choose (MVA)b = 100, (KV)b = 138

Q3.

A delta-connected source supplies a delta-connected load through wires having impedances of Z_{line}=0.2+j0.6Ω, the load impedance are Z_Δ=30+j60 Ω, the balanced source ab voltage is V_{ab}=415<60 .Find the line current, the line voltage at the load, the current in each phase of the load, the power delivered to the load, and that dissipated in the line. Draw the per phase equivalent circuit .



Dr_ mahmoud awad

Power system analysis 1

Second exam 2/12/2014

19/20

الاسم : [redacted]

Q1.

1. Fill in the blanks by inserting appropriate words.

(*i*) In short transmission lines, the effects of....capacitance.... are neglected.

(*ii*) ...Resistance...... of transmission lines, is the most important cause of power loss in the line.

(*iii*) In the analysis of 3-phase transmission line, only...one phase... Is considered.

(*iv*) For a given *VR* and *I*, the regulation of the line...increase... With the decrease in p.f. for lagging loads.

(*v*) If the p.f. of the load decreases, the line losses....decrease.

(*vi*) In medium transmission lines, effects of ...Capacitance (shunt) are taken into account.

(*vii*) The rigorous solution of transmission lines takes into account the ..distrubited..... nature of line constants.

(**viii**) **In any transmission line, *AD–BC* =..............1..............**

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(*ix*) In a transmission line, generalized constants ....A....... and ....D........ are equal.

(*x*) The dimensions of constants *B* and *C* are respectively ....Ω..... and.......S.......

2. Pick up the correct words/figures from the brackets and fill in the blanks.

(*i*) The line constants of a transmission line are....................... [*Uniformly distributed, lumped*]

(*ii*) The length of a short transmission line is upto about...80 km.... [*50 km, 120 km, 200 km*] 80 km

(*iii*) The capacitance of a transmission line is a .... element. [*Series, shunt*]

(*iv*) It is desirable that voltage regulation of a transmission line should be................ [*Low,high*]

(*v*) When the regulation is positive, then receiving and voltage (*VR*) is ..less.. than sending and voltage (*VS*). [*More, less*]

Q2.

The symmetrical components of current in an unbalanced four-wire three-phase system are:

$I_0 = 67A \angle -51.4°$ $\quad I_1^{+} = 101.4A \angle 10.77°$ $\quad I_2^{-} = 53A \angle 141°$

If the system voltages are balanced, find the currents in each phase

y=j

$I_A = I_0 + I_1 + I_2$

$= 67\angle -51.4 + 101.4\angle 10.77 + 53\angle 141$

$\boxed{100.22\angle -.034 \text{ A}}$

$$\begin{bmatrix} I_A \\ I_B \\ I_C \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a & a^2 & a \\ a & a & a^2 \end{bmatrix} \begin{bmatrix} I_0 \\ I_1 \\ I_2 \end{bmatrix}$$

$I_B = I_0 + a^2 * I_1 + a I_2$

$a = 1\angle 120$

$a^2 = 1\angle -120$

$I_B = 67\angle -51.4 + 101.4\angle 10.77 * 1\angle -120$

$+ 1\angle 120 * 53\angle 141$

$= \boxed{200.45\angle -89.968}$

6/6

$I_C = I_0 + a I_1 + a^2 I_2$

$= 67\angle -51.4 + 1\angle 120 * 101.4\angle 10.77$

$+ 1\angle -120 * 53\angle 141$

$= ~~190.875\angle -4.07~~$

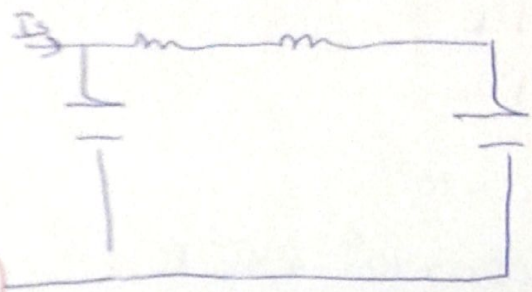
$\boxed{50.139\angle 60 \text{ A}}$

(a)

A 150-km, 230-kV, 60 Hz three-phase line has the following positive-sequence impedance and admittance:

$z = 0.08 + j0.48\ \Omega/km$

$y = j03.33x\ 10^{-6}\ S/km$. At full load, the line delivers 250 MW at 0.99 p.f. lagging and at 220 kV. Using the nominal π circuit, calculate: (a) the ABCD parameters, (b) the sending-end voltage and current, and (c) the percent voltage regulation (d) Transmission-line efficiency at full load.



$V_S = (1 + \frac{Zy}{2}) V_R + Z I_R$

$I_S = y(1 + \frac{yZ}{4}) V_R + (1 + \frac{Zy}{2}) I_R$

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$Z = (0.08 + j.48) * 150 = \boxed{12 + j72}\ \Omega$

$y = j\, 3.33 * 10^{-6} * 150 = \boxed{j\,4.995 * 10^{-4}}\ S$

$D = A = (1 + \frac{Zy}{2})$ ~~= 1.003 ∠ 1.027~~ $\boxed{.982 \angle .174}$

$C = y\,(1 + \frac{Zy}{4}) = \boxed{4.95 * 10^{-4} \angle 90.086}\ S$

$B = Z = (12 + 72j) = \boxed{73 \angle 80.53}\ \Omega$

(b)

$V_S = A V_R + B I_R$ $\quad I_R = \frac{250 * 10^6}{(.99 * \sqrt{3} * 220)}$

$= (.982 \angle .174) * \frac{220}{\sqrt{3}} + 73 \angle 80.53 *$ $662.706 \angle -8.1096$

~~(.33.89)~~ $\boxed{662.709 \angle -8.1096}$

$\rightarrow 146\ 886.8 \angle 18.45$

$I_S = C V_R + D I_R$

$(4.95 * 10^{-4} \angle 90.086) * \frac{220 * 10^3}{\sqrt{3}} + .982 \angle .174 * 662 \angle -8.10$

$= 645.07 \angle -2.396$

Power system analysis 1 جامعة البلقاء التطبيقية

اسم: [redacted]

20/20

Q1,.

1. Fill in the blanks by inserting appropriate words.

(*i*) In short transmission lines, the effects of capasitance are neglected.

(*ii*) resistance of transmission lines, is the most important cause of power loss in the line.

(*iii*) In the analysis of 3-phase transmission line, only one phase Is considered.

(*iv*) For a given *VR* and *I*, the regulation of the line increse With the decrease in p.f. for lagging loads.

(*v*) If the p.f. of the load decreases, the line losses increse

(*vi*) In medium transmission lines, effects of capasitance are taken into account.

(*vii*) The rigorous solution of transmission lines takes into account the disstrbeuted nature of line constants.

(*viii*) In any transmission line, *AD*−*BC* = 1 (one)

(*ix*) In a transmission line, generalized constants A and D are equal.

(*x*) The dimensions of constants *B* and *C* are respectively ohm and Semis $\left(\frac{1}{ohm}\right)$

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Q2.A 138 kV, 200 MVA, 60 Hz, three-phase, power transmission line is 100 km long, and has the following
Characteristics:
$r = 0.103\ \Omega/km$
$x = 0.525\ \Omega/km$
$y = 3.3 \cdot 10^{-6}\ S/km$

1- What is per phase series impedance of this transmission line?

(A) 10.3+ *J52.5* Ω B) 103 + J525 Ω C) 1.03 + J5.25Ω D) 0.103 + J0.525 Ω

*2-*The transmission line should be modeled as

A) Long B) short (C) medium D) none of above

3. Calculate the *ABCD* constants of this transmission line.

A) A= 0.9913/0.1Ω B= 53.5/78.9Ω C= 3.286*10 /90 S D= 0.9913/0.1Ω
(B) A= 0.9913/0.1° B= 53.5/78.9Ω C= 3.286*10 /90°S D= 0.9913/0.1°
C) A= 0.9913/0.1Ω B= 53.5/78.9Ω C= 3.286*10 /90°S D= 0.9913/0.1°

4- Calculate the sending end voltage if the line is supplying rated voltage and apparent power at 0.90 PF lagging.

A)Vs=11.18/1.875°KV B)Vs=111.8/187.5°KV (C)Vs=111.8/18.75°KV D)Vs=11.18/18.75°KV

5- Calculate the sending end current if the line is supplying rated voltage and apparent power at 0.90 PF lagging.

A)Is=81.87/-24.05°A B)Is=818.7/24.05°A C)Is=81.87/24.05°A (D)Is=818.7/-24.05°A

6- What is the voltage regulation of the transmission line for the conditions in *(4)*?

(A) 40.3% B) 4.03% C) 20.3% D) 2.03%

*7-*What is the efficiency of the transmission line for the conditions in *(4)*?

A) η= 8.93% (B) η= 89.3% C) η= 94.4% D) η= 9.44%

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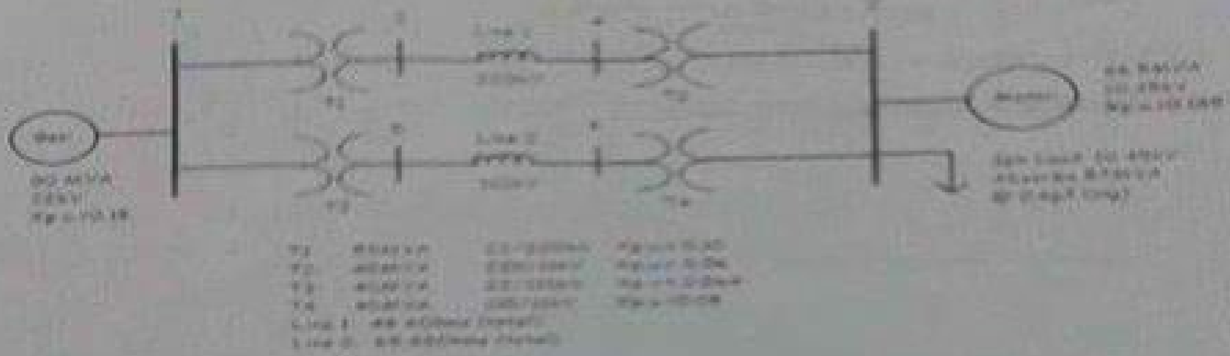
Q3. The zero, positive and negative sequence voltages of phase 'a' are given below. Find out the phase voltages Va, Vb and VC.
V0=200/0°, V1=210/-30°, V2=150/190°

Va = 268.32 /-29.23 v
Vb = 247.95 /-62.48 v
Vc = 431.65 /54.39 v

3

Q1. The one-line diagram of a power system is shown in Figure 1.Draw an impedance diagram showing all impedances in per unit on a 100-MVA base. Chose 22 KV as the voltage base for generator.



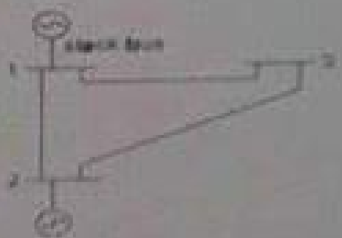
Q2. A long transmission line delivers a load of 60 MVA at 124 KV, 50 HZ, at 0.8 power factor lagging. Resistance of the line is 25.3Ω, reactance is 66.5Ω and admittance due to charging capacitance is $0.442*10^{-3}$ mho. Find (a) A,B,C,D constants (b) sending end voltage, current and power factor (c) regulation (d) efficiency of the line.

Q3. The single line diagram of a sample 3- bus power system. Data for this system are given in table 1 and 2.

(a) Using the Gauss-Seidel method, determine the phase values of the voltage at buses 2 and 3 (perform only two iterations).

(b) Find the slack bus real and reactive power after second iteration.

(c) Determine the line flows and line losses after second iteration. Neglect line charging admittance.



Bus code i	Assumed bus voltage	Generation MW	Generation MVAr	Load MW	Load MVAr
1 (slack bus)	1.05 + j0.0	-	-	0	0
2	1 + j0.0	[illegible]	[illegible]	[illegible]	[illegible]
3	1 + j0.0	[illegible]	[illegible]	138.6	45.2

Base MVA = 100

Bus code i - k	Impedance Z_{ik}
1-2	0.02 + j0.04
1-3	0.01 + j0.03
2-3	0.0125 + j0.025

10 - 20j
10 - 30j
16 - 32j

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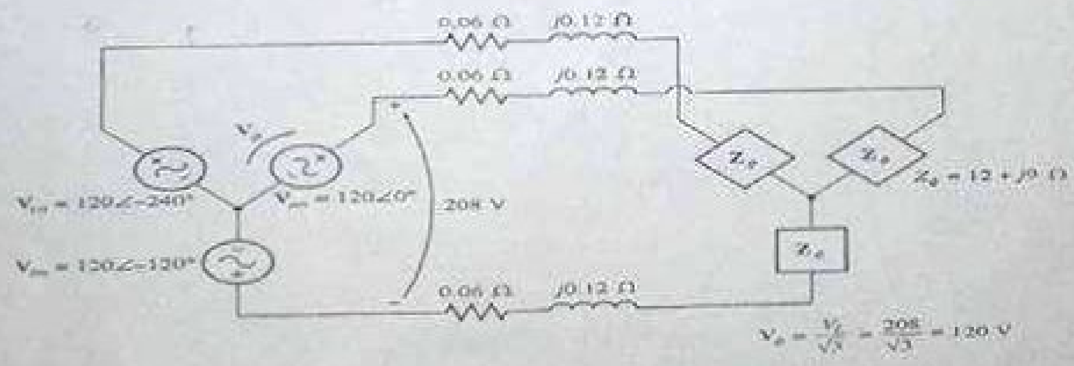
Final exam 20/5/2015

Q1. A 60 Hz, three phases, 110 kV transmission line has a length of 100 miles and a series impedance of
$0.20 + j0.85\ \Omega$ /mile and a shunt admittance of 6 μS/mile. The transmission line is supplying 60 MW at a power factor of 0.85 lagging and the receiving end voltage is 110 kV.

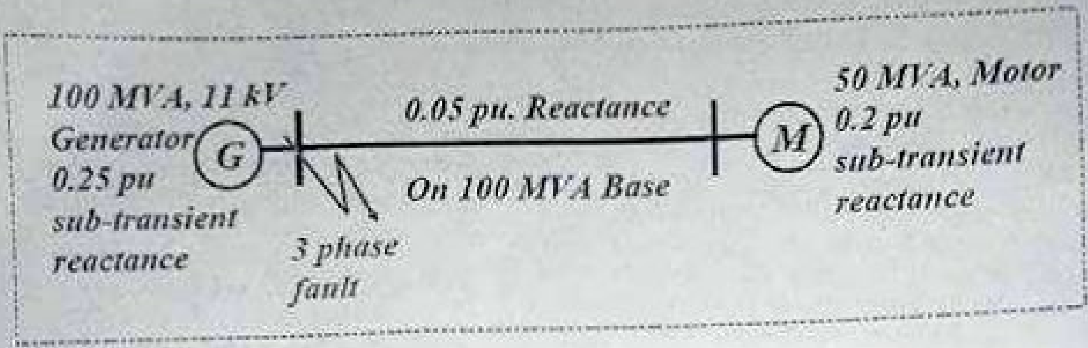
(a) What are the voltage, current, and power factor at the receiving end of this line?
(b) What are the voltage, current, and power factors at the sending end of this line?
(c) How much power is being lost in this transmission line?
(d) What is the current angle δ of this transmission line?

Q2. A 208-V three phase power system is shown in Figure. It consists of an ideal 208-V Y-connected three-phase generator connected through a three phase transmission line to a Y-connected load. The transmission line has an impedance of $0.06 + j\,0.12\ \Omega$ per phase and the load has an impedance of $12 + j9\Omega$ per phase. For this simple power system, find:

a) The magnitude of line current I_L
b) The magnitude of the load's line and phase voltages V_{LL} and $V_{\phi L}$
c) The real, active and apparent powers consumed by the load
d) The power factor of the load
e) The real, reactive and apparent powers consumed by the transmission line
f) The real, reactive and apparent powers supplied by the generator.
g) The generator's power factor



Q3. The motor is drawing 40 MW at 0.8 Pf. leading with terminal voltage of 10.95 KV. Calculate the total current in the generator and motor during three phase short circuit.



Q4. *For the system shown in the figure, the line impedances are as indicated in per unit on 100MVA base.*

A. Using Gauss-Seidel method finds the bus voltages after 2 iterations.

B. Using the bus voltages find the Slack bus real and reactive power.