ACY-2021-22

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

Power System Analysis I(18EE62)

THIRD INTERNAL ASSESSMENT

Duration: 90 Minutes
date: 14.07.22

VI Semester
Max Marks: 40

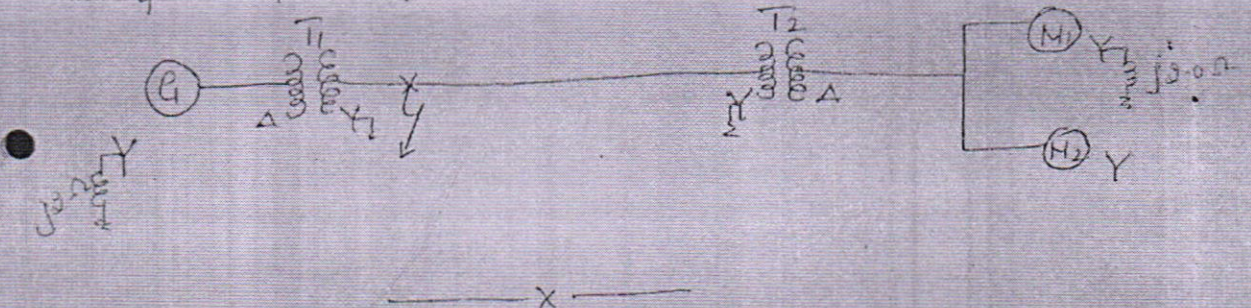
NOTE: Answer two full questions

1.a) Derive an expression for the fault current when an LLG fault occurs on an unloaded generator through a fault impedance Zf. Draw the inter connection of sequence networks. 10M(co4)

b) A 400V star connected neutral grounded three phase generator is subjected to various types of faults. The fault currents for various types of faults are
i) Three phase---120amperes
ii) L-L Fault ----150amperes
iii)L-G Fault---250amperes
determine the sequence impedances. 10M(co4)

2.a) Derive an expression for the fault current when an LL fault occurs on power system through a fault impedance Zf. Draw the inter connection of sequence networks. 10M(co4)
b) Derive an expression for the fault current when an LG fault occurs on an unloaded generator. Draw the inter connection of sequence networks. 10M(co4)

3.a) A 30MVA, 13.8kV, 3 phase alternator has a Xd=15%, X2=15% & X0=5% respectively. The alternator supplies two motors over a transmission line having transformers at both ends as shown in figure. The motors have rated inputs of 20MVA & 10MVA. Both 12.5kV with Xd=20%, X2=20% & Xo=5% respectively. Current limiting reactors of 2.0Ω each are in the neutral of the alternator and a large motor. The 3 phase transformers are both rated 35 MVA, 13.2 delta – 115 Y kV, with leakage reactance of 10% . Series reactance of the line is 80Ω. The zero sequence reactance of the line is 200Ω. Determine the fault current when L-G fault takes place at the point P. Assume Vf=120kV. 20M(co4)



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Power System Analysis - 1 (18EE62)

Scheme of Evaluation:

1.a) Derivation : LLG fault.

Circuit diagram
Terminal conditions
Symmetrical component Relations
Interconnection of Sequence N/w
Sequence quantities
Expression for fault current

→ 10 M

b) $X_1 = 1.924\,\Omega$
$X_2 = 0.743\,\Omega$
$X_0 = 0.105\,\Omega$

→ 10 M.

2.a) Circuit diagram
Terminal conditions
Symmetrical component Relations
Interconnection of Sequence N/w
Sequence quantities
Expression for fault current

$|I_f| = \sqrt{3}\, I_{a1}$

$= \sqrt{3}\,\frac{E_a}{Z_1 + Z_2 + Z_f}$

→ 10 M

b) LG fault:

Circuit diagram
Terminal conditions
Symmetrical Component Relations.
Interconnection of Sequence N/w
Sequence quantities
Expression for fault current.

$I_f = 3 I_{a0}$

$= 3 \times \frac{E_a}{Z_1 + Z_2 + Z_0}$

→ 10 M

3.a) Calculation of $(kV)_B$ values. → 2M
Calculation of Reactances (+ve, -ve & Zero Seq) → 4M

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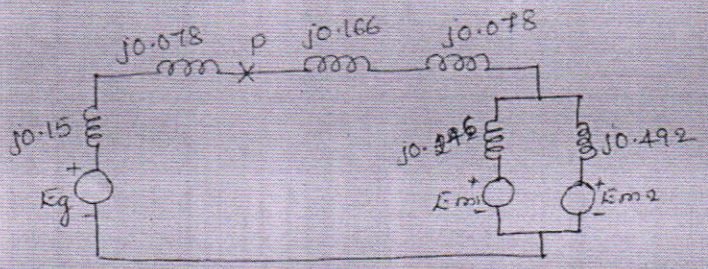
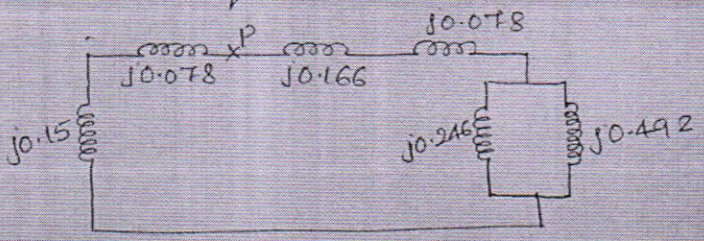
+ve Seq N/w



→ 4M

Z_{1th} = j0.146 pu

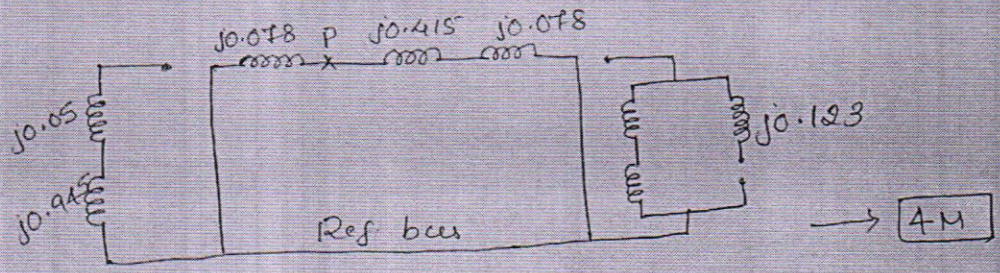
-ve Seq N/w



Z_{2th} = j0.146 pu

→ 4M

Zero Seq N/w



→ 4M

Z_{0th} = j0.0673 pu

LG fault $I_f = \frac{3V_{th}}{Z_{1th} + Z_{2th} + Z_{0th}}$ → 2M

I_f = 8.339 pu

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