

**KING FAHD UNIVERSITY OF PETROLEUM & MINERALS**  
**ELECTRICAL ENGINEERING DEPARTMENT**

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**EE-463**

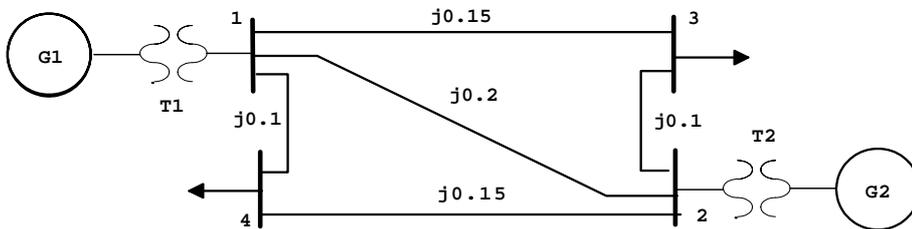
**Key Solution**

Quiz # 3    Serial #

Name:

I.D.#

Consider the 4-bus system shown below. The generators are rated at 11 KV, 100 MVA with subtransient reactance of 10% each. The transformers are rated at 11/110 KV, 100 MVA with a leakage reactance of 5%. The reactances of the lines to a base of 100 MVA and 110 KV are indicated on the figure. Find the short circuit solution (subtransient fault current) for a three-phase symmetrical solid fault at bus 4. Assume pre-fault voltages of 1.0 per unit, and pre-fault currents to be zero.



↓  $Z_F = 0$

Gen:  $j0.15$   $j0.15$   $j0.15$   $j0.15$

Series  $j0.15$   $j0.1$   $j0.2$   $j0.15$  Fault

⇒  $j0.15$   $j0.15$   $j0.15$   $j0.15$   $j0.25$   $j0.2$   $j0.15$

||el  $\frac{0.25 * 0.2}{0.45} = 0.11$

↓

$j0.15$   $j0.15$   $j0.15$   $j0.15$   $j0.11$   $j0.15$   $j0.15$

⇒  $A = \frac{0.1 * 0.11}{0.1 + 0.11 + 0.15} = \frac{0.1 * 0.11}{0.36} = 0.03055$

$B = \frac{0.11 * 0.15}{0.36} = 0.04583$

$C = \frac{0.1 * 0.15}{0.36} = 0.04166$

↓

$j0.15$   $j0.15$   $j0.15$   $j0.15$   $j0.19583$   $j0.19583$   $j0.04166$

||el  $j0.09$

$j0.18055$   $j0.03055$   $j0.19583$   $j0.19583$   $j0.04166$   $F$

$Z_t = j0.09394 + j0.04166 = j0.13560$

$I_{Fault} = \frac{1.0}{j0.13560} = -j7.37463 \text{ pu}$