

Kafrelsheikh University - Faculty of Engineering
Electrical Engineering Department – Final Exam (16 - 6 - 2019)

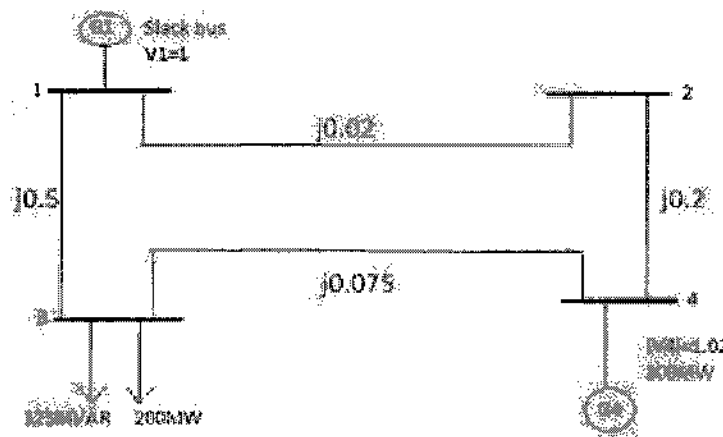


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|----------|---------------------------------------|------|---------|
| Course | EPM3211 Power System Analysis (1) | Time | 3 HOURS |
| Students | 3 rd Year Electrical Power | Mark | 90 |

This exam measures the ILOs: a.1.2, a.1.3, a.5.3, a.21.2, b.1.1, b.11, c.2

Answer the following TWO questions:

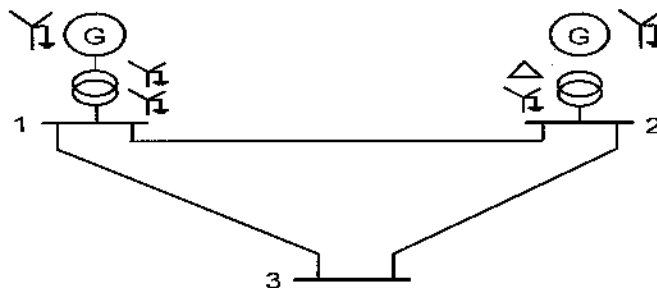
(Q1) a) A single-line diagram is shown below with all impedances and voltages are in per unit. The base power is 100 MVA. Do the power flow analysis if the load increased by 10%, find the necessary voltage magnitudes and angles and stop after the second completed iteration using Newton- Raphson method. Find the power flow and power losses of each line.



(30 Marks)

b) A two-generator system has demand power $P_D = P_{G_1} + P_{G_2} = 1000$ MW. The fuel cost function for the generators are $C_1 = 600 + 15 P_{G_1} + 0.05 P_{G_1}^2$ and $C_2 = 700 + 20 P_{G_2} + 0.04 P_{G_2}^2$. The two generators' limits are 200 MW, 800 MW for G_1 and 100 MW, 500 MW for G_2 . Calculate the optimal dispatch values P_{G_1} , P_{G_2} and the incremental cost. (20 Marks)

(Q2) For a line-to-ground fault at bus 3 of the power system below, calculate the fault current and phase voltages at each bus (Use Z_{bus} method). Given the following Positive, negative and zero sequence impedances in per unit: For the generators $Z^+ = Z^- = j0.2$; $Z^0 = j0.05$. For the transformers $Z^+ = Z^- = Z^0 = j0.05$. For the lines $Z^+ = Z^- = j0.1$; $Z^0 = j0.3$. Assume unloaded pre-fault with voltages $= 1.0 \angle 0$ p.u. Repeat the solution for the L-L fault and L-L-G fault. Compare between the results of the three types of fault.



(40 Marks)