Menoufia University
Faculty of Engineering, Shebin El-Kom
Electrical Engineering Department
Postgraduate-Master of science
Second Semester

Subject/Code: High and Extra-High Voltage Engineering/ ELE 607
Year: 2019-2020
Time Allowed: 3 hours
Exam Date: 13 /8/2020
Total Marks: 100 marks

Answer the following questions and assumes any missing data

Question 1 *(25 marks)*

(1-a) A tower has two ground wires each with Zg = 400 ohms. For I_s = 100 kA, crest, calculate the tower top potential considering tower footing resistance 5, 10, and 20 Ω. Also, explain how the tower footing resistance can affecting backflashover. What are the methods that can be used for decreasing the backflashover?

(1-b) Compare between gap and gapless surge arrester. Also, discuss how to select surge arrester rating considering an example.

(1-c) Explain the basic principal of operation of rod gap. Also, describe how to select rod gap length in extra high voltage system considering an example.

Question 2 *(25 marks)*

(2-a) Discuss how to determine parameters of extra high voltage surge arresters considering Pinceti and Giannettoni model.

(2-b) Describe the impact of ferromagnetic ring on transient overvoltage in gas insulated substations (GIS). Also, explain the impact of the ferromagnetic rings on the surge arresters in GIS. If there are problems when the ferromagnetic rings are connected, give a solution.

(2-c) Explain the reasons for the backflasover in power system. What are the methods that can be used for decreasing the backflasover?

Question 3 *(25 marks)*

(3-a) Expand the following abbreviations for insulation type: HPOF, XLPE, PPLP and SF6. Then declare the construction of each type.

(3-b) Discuss how to experimentally determine critical breakdown gradient of insulation samples using Weibull Probability Function.

(3-c) Describe the different cooling types of extra high voltage cables with declaring the laying methods in the soil. Also, discuss how the environment of cable can affect its rating.

Question 4 *(25 marks)*

(4-a) Discuss how to experimentally determine critical breakdown gradient of insulation samples using Weibull Probability Function.

(4-b) A 3-phase 275 kV cable system consisting of 3 single-core cables is designed to operate at a maximum voltage of 287 kV, line-to-line. Its life is expected to be 30 years. In the factory, a 15 minute test is intended to be given. Taking n = 12, calculate the magnitude of test voltage to be applied between conductor and sheath that will simulate service conditions using maximum continuous voltage as the basis for design. If the power-frequency test is lengthened to 24 hours, calculate the new magnitude of the test voltage and compare the results.

With our best wishes

Prof. Dr. Mohamed Izzularab and Assis Prof. Dr. Amr Abdelhady