

Menoufiya University
Faculty of Engineering
Shebin El-Kom
Postgraduate-PhD
Final Exam



Subject/code: High Voltage
Engineering/ELE702
Time Allowed: 3 hours
Year: 2016-2017
Date: 3-6-2017

Allowed Tables and Charts: (None), Total marks: 100

Answer ALL Questions and assume any missing data:

Question (1)

(30 Marks)

(1-a) What is meant by DGA? Describe the main objectives of DGA.

(1-b) Write short notes on: Types of transformer faults - DGA diagnostic methods.

(1-c) State the different importance of fault gases generated by internal faults in a transformer.

Question (2)

(40 Marks)

(2-a) Discuss how to determine the fault type using Ratio of key gases considering the first three cases reported in Table 1 with the help of Table 2

(2-b) Compare between Duval triangle and New graphical technique DGA methods considering all the following cases (see Table 1, Figure 1, and Figure 2).

Table 1

Case #	H ₂	CH ₄	C ₂ H ₄	C ₂ H ₆	C ₂ H ₂
Case 1	21	14	90	191	0
Case 2	18	35	110	2	0
Case 3	407	28	21	15	0
Case 4	119	8	0	20	21
Case 5	48	20	41	69	31

Question (3)

(30 Marks)

(3-a) What is polymer nanocomposite and give its constituents?

(3-b) Describe the importance of nanotechnology in high voltage applications.

Table 2

Ratios for Key Gases – Rogers Ratios Method				
Case	Ratio 2 (R2) C_2H_2/C_2H_4	Ratio 1 (R1) CH_4/H_2	Ratio 3 (R3) C_2H_4/C_2H_6	Suggested Fault Type
0	<0.01	<0.1	<1.0	Normal
1	≥ 1.0	$\geq 0.1, <0.5$	≥ 1.0	Discharge of low energy
2	$\geq 0.6, <3.0$	$\geq 0.1, <1.0$	≥ 2.0	Discharge of high energy
3	<0.01	≥ 1.0	<1.0	Thermal fault, low temp <300 °C
4	<0.1	≥ 1.0	$\geq 1.0, <4.0$	Thermal fault, <700 °C
5	<0.2	≥ 1.0	≥ 4.0	Thermal fault, >700 °C

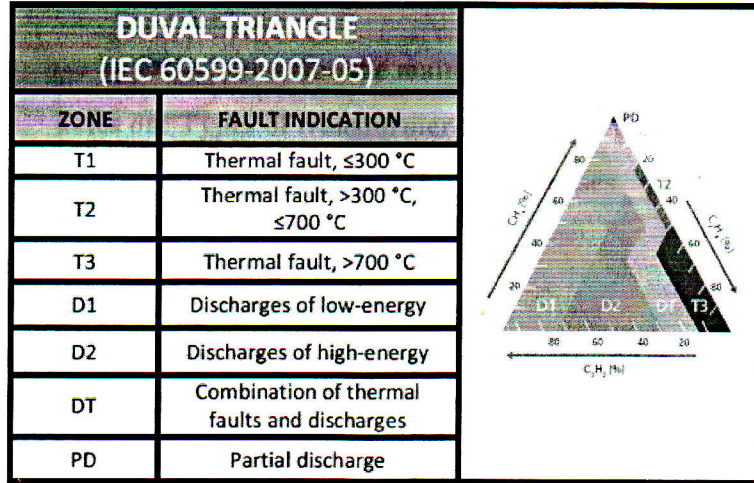


Figure 1

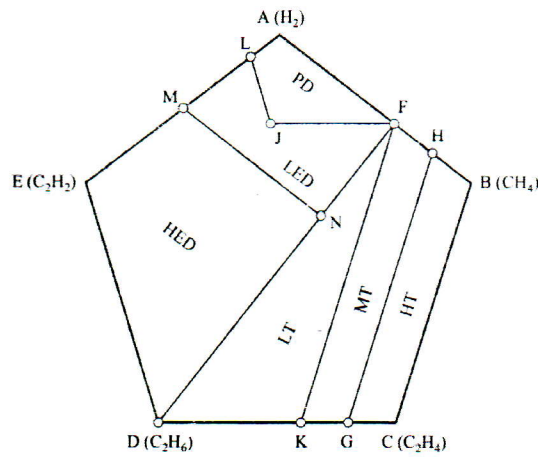


Figure 2

Good Luck Prof. Mohamed A. Izzularab
Dr. Amr M. Abdelhady

This exam measures the following ILOs											
Skills	Knowledge & Understanding Skills				Intellectual Skills				Professional Skills		
	a1-1	a2-1	a4-1		b1-1	b9-1			c2-1	c3-1	
Question Number	Q1-a, b	Q1-c Q2-b	Q3-a,b		Q1-a,b	Q3-a			Q3-b	Q2- a,c	