الآلات الكهربية (2)

Kafrelsheikh University
Faculty of Engineering
Subject: **Electrical Machines (2)**
Year: Third Electrical power (R. 2007)
Exam Date: 27/5/2018

Final Exam of 2nd semester-2017-2018
Department of Electrical Engineering
course code: EPM3209 Full Mark: 100 Marks
number of pages: 2 Time allowed: 3 hours

This exam measure the following ILOs (a1, a4, a13, a14, b2, b7, b13, c3, c13, d5, d7)
Attempt to salve all question

Q1: (15 Mark)

a) Explain the value of mutual inductance, coefficient of coupling between two coils, and the value of induced force on wire. [5 Marks]

b) Two coils, *A* of 12,500 turns and *B* of 16,000 turns, lie in parallel planes so that 60 % of flux produced in *A* links coil *B*. It is found that a current of 5A in A produces a flux of 0.6 mWb while the same current in *B* produces 0.8 mWb. Determine (*i*) mutual inductance and (*ii*) coupling coefficient. [10 marks]

Q2: (20 Mark)

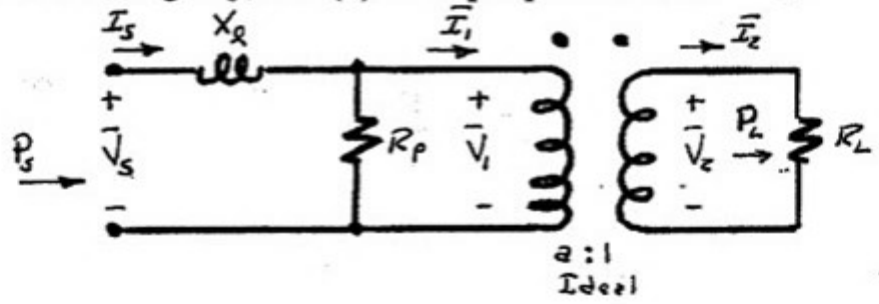
a) Explain with needed sketch the transformer cooling, and what is a Buchholz Relay and How Does it Work? [10 marks]

b) A 250 kVA, single phase transformer has iron loss of 1.8 kW. The full load copper loss is 2000 W. calculate (i) efficiency at full load, 0.8 lag. Pf. (ii) kVA supplied at maximum efficiency. (iii) maximum efficiency at 0.8 lag. Pf. [10 marks]

Q3: (20 Mark)

a) Construct the phasor diagram of single phase transformer under load at lag. Pf.. [5 marks]

b) For the ideal transformer circuit of Figure below, $R_p = 18\,\Omega$, $R_L = 6\,\Omega$, and $X_\ell = 0.5\,\Omega$. If $\bar{V}_2 = 120\angle 0°$ V and $P_S = 5600$ W, (*i*) determine the turns ratio *a*, (*ii*) the source voltage $\bar{V}_S$, and (*ii*) the input power factor PF_S. [15 marks]



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Q4: (25 Mark)

a) What is the Sumpner's test? Explain with needed sketch. [10 marks]

b) A 3 phase step down transformer is connected to 6600 V mains and it takes 10 A. calculate the secondary line voltage, line current, and output for the following connections.

i) star-star, *ii*) star-delta, *iii*) delta-star turns ratio/phase is 12. Draw connection diagrams. [15 marks]

Q5: (20 Mark)

a) What is the effect of harmonic in voltage and current in transformers[5 marks]

b) Mention the advantages and disadvantages of instrument transformer and how to reduce the transformer instrument error [5 marks]

c) Explain the channel type induction heating transformer [5 marks]

d) Drive the design output equation of single phase core type transformer. [5 marks]

With my best wishes
Dr. Eng./Mohamed I. Abd EL_Wanis