Kafrelsheikh University
Faculty of Engineering
Subject: **Electrical Machines (2)**
Year: Third Electrical power (R. 2007)
Exam Date: 9/6/2019

Final Exam of 2nd semester-2018-2019
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) Drive the design output equation of three phase shell type transformer.   [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) Drive from the first principles, the emf equation for a transformer.   [10 marks]

  b) The parameters of a 2300/230 V, 50-Hz transformer are given below:

$R_1 = 0.286\ \Omega\ R_2' = 0.319\ \Omega\ R_0 = 250\ \Omega,\ X_1 = 0.73\ \Omega\ X_2' = 0.73\ \Omega\ X_0 = 1250\ \Omega$

The secondary load impedance $Z_L = 0.387 + j\ 0.29$. Solve the exact equivalent circuit with normal voltage across the primary.   [10 marks]

Q3:   (20 Mark)

  a) What do we mean by an inrush of a transformer's magnetizing current?   [5 marks]

  b) An autotransformer has a coil with total number of turns $N_{CD} = 200$ between terminals C and D. It has got one tapping at A such that $N_{AC} = 100$ and another tapping at B such that $N_{BA} = 50$. Calculate currents in various parts of the circuit and show their directions when 400 V supply is connected across AC and two resistive loads of 60Ω & 40Ω are connected across BC and DC respectively.   [15 marks]
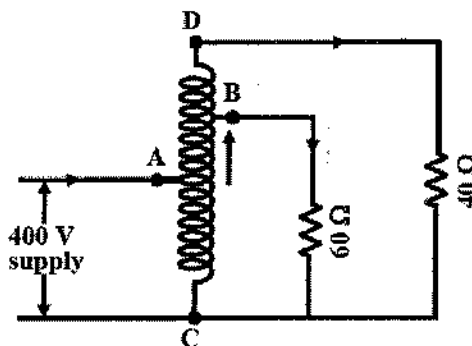
Q4:   (25 Mark)

a) Explain the Y-Y connection of three phase transformer and what is the phasor group of Yy0.   [10 marks]

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b) A Δ-Δ bank consisting of three 40 kVA, 2300/230 V transformers supplies a load of 80 kVA. If one transformer is removed, find for the resulting V-V connection

i) kVA load carried by each transformer

ii) percent of rated load carried by each transformer

iii)   total kVA rating of the V-V bank

iv)   ratio of the V-V bank to Δ-Δ bank transformer ratings   [15 marks]

Q5:   (20 Mark)

a- What are the principle of operation, connection, phasor and analysis of   the phase shifting transformer   [10 marks]

b- Choose the correct answer with explain your choice   [10 marks]

1. The transformer ratings are usually expressed in.......

A. Volts   B. Amperes   C. Kw   D. Kva

2. Which of the following does not change in an ordinary transformer........

A. Frequency   B. Voltage   C. Current   D. Any of the above

3. Generator transformers are........

A. Step-up transformers   B. Step-down transformers   C. Auto-transformers   D. One-one transformers

4. Harmonics in transformer result in........

A. Increased core losses   B. Increased I^{2}R losses   C. Magnetic interference with communication circuits   D. All of the above

5. A transformer core is laminated to.......

A. Reduce hysteresis loss   B. Reduce eddy current loss   C. Reduce copper loss   D. Reduce all above losses

6. No-load on a transformer is carried out to determine........

A. Copper loss   B. Magnetising current   C. Magnetising current and loss   D. Efficiency of the transformer

7. Sumpner's test is conducted on transformers to determine........

A. Temperature   B. Stray loss   C. All-day efficiency   D. All of the above

8. A relatively light loads,transformer efficiency is low because........

A. Second output is low   B. Transformer losses are high   C. Fixed loss is high in proportion to the output   D. Cu loss is small

9. Which of the following is not a basic element of transformer?........

A. Core   B. Primary Winding   C. Secondary Winding   D. Mutual Flux

10. The all-day efficiency of a transformer depends primirily on........

A. Its copper loss   B. The amount of load   C. The duration of load   D. Both (b) and (c)

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