Q	Mark
1	10/12
2	8/16
3	0/6
4	0/16
5	0/20
6	10/16
7	6/14
SUM	34/100

University of Jordan

Electrical Eng. Dept

93371 Electrical Machines (1) — Second Exam.

Prof. D.Dalabeih — 5-12-2013

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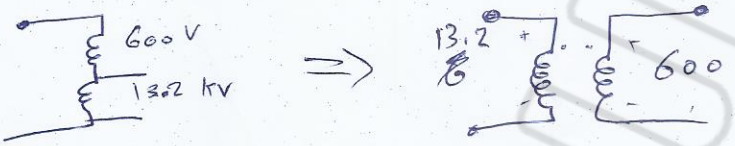
Q1) An autotransformer is rated at (13.8 kV/13.2 kV), 2000 kVA. If it is converted to an ordinary transformer, evaluate its rating. [12%]



$\frac{N_c}{N_{se}} = \frac{13.8}{600} = 23$

$\frac{S_{io}}{S_w} = \frac{N_c + N_{se}}{N_{se}}$

$S_w = \frac{2000\ kVA}{23+1}$

$S_w = 83.3\ kVA$

$V_{h1} = 13.2\ kV$

$V_h = 600\ kV$

$a = 23$

Q2) A three-phase transformer bank is required to supply 900 kVA and have (132/33) kV voltage ratio. Find the ratings of each individual transformer in the bank (HV,LV,turns ratio and apparent power) if the transformer bank is connected as: a) Y-Δ b) V-V [16%]

$S_{3\phi} = 900\ kVA$ Y-Δ

$HV = 228.6\ kV$

$LV = 33\ kV$

$a = \frac{HV}{LV} = 4$

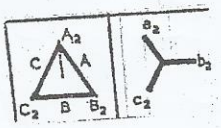
$S = 900\ kVA$

Δ Δ

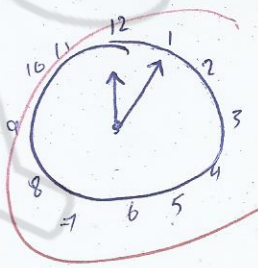
$HV = 132\ kV$

$HV = 33\ kV$

$a = 4$

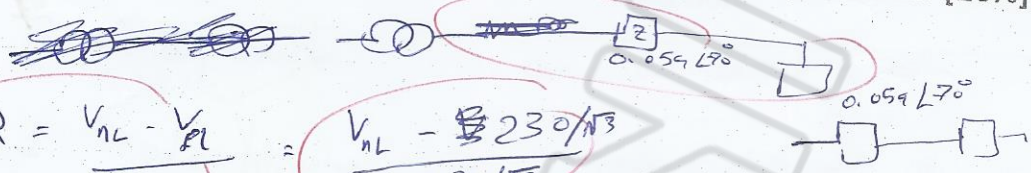


Q3) Find the vector symbols for the following vector diagram of a three phase transformer. [6%]



Q4) A 100 MVA, 230/115 –kV Δ-Δ three-phase transformer has a series impedance of $0.059\angle 70^0$ pu. If it supplies a load of 80 MVA at 0.85 pf lagging, evaluate its voltage regulation by using pu quantities. [16%]

0/16



$$VR = \frac{V_{nL} - V_{fl}}{V_{fl}} = \frac{V_{nL} - 230/\sqrt{3}}{230/\sqrt{3}}$$

Q5) Two 6600/440 step-down transformers (A&B) having the following ratings are connected in parallel:
A: 250 kVA and impedance of $0.05\angle 76.7^0$ pu based on its ratings.
B: 600 kVA and impedance of $0.04\angle 80.9^0$ pu based on its ratings.
How these transformers share load of 680 kW at o.8 pf lagging.[20%]

0/20

Q6) a-State the name and the function of the 6 components indicated on the machine shown in Fig. 1: [12%]

No	Name	Function
1	~~Field~~ windings	to Generate magnetic ~~Field~~ Field
2	rotor / Armature winding,	to generate induced voltage / emf / current
3	✓	to remove the nutral Pole,
4	✓	to remove the magnetic Field that generated by armature windings (coils)
5	✓	Connect coiter on it
6	~~brushes~~ brushes ✓	to ~~connect the carbon~~ to transmite the current that generated

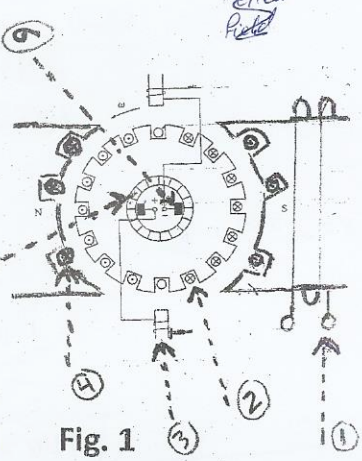


Fig. 1

b-Is the machine in Fig. 1 a dc generator or motor and say why? [4%]

dc Generator, because by RHR thumb with w, Forefinger with B, and current with mid Finger / and @ interpoler region there is no current and its happen in Generator

Q7) For the machine shown in Fig. 2:

a-What is the type of its armature winding? [4%]

~~Progressive~~ / Simplex

b-If the machine has: Φ_p=0.01 Wb, n=2500 rpm, 15 turns/coil and current per conductor=10 A, evaluate its induced voltage and torque. [10%]

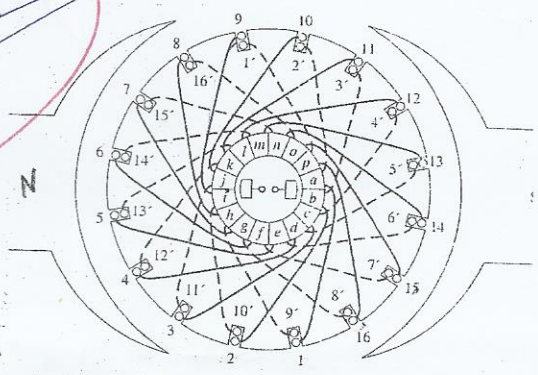


Fig. 2

$E = K\phi n = \frac{pz}{a}\phi n = \frac{2*(16*2*15)}{2} * 0.01 * \frac{2500}{60} = 200\ Volt = E$

$T = \frac{2}{\pi} \phi I * 8 * 15 = 7.639$