

Faculty of Engineering/University of Misurata

Department/ Electrical Eng. Date of Exam/ 02/08/2015
 subject/Elect. Power Eng. Final exam/Spring 2014/2015 Time/ 3 hrs
 Lecturer/Omar Gatous desk N^o/.....

Answer all the following questions

Question one:

1. Choose the right answer:
 - a) An auto-transformer is
 - i. A transformer with one winding.
 - ii. A transformer with two windings.
 - iii. A transformer with three windings.
 - b) The distributors for residential areas are
 - i. Single-phase.
 - ii. Three-phase three wire.
 - iii. Three-phase four wire.
 - a) No-load test on a transformer is carried out to determine
 - i. Copper loss.
 - ii. Magnetizing current.
 - iii. Magnetizing current and no-load loss.
2. Show by sketch the connection of the potential transformer.
3. The no-load current of a transformer is 4.0 A at 0.25 pf when supplied at 250 V, 50 Hz. The number of turns on the primary winding is 200. Calculate
 - i. The r.m.s. value of the flux in the core (assume sinusoidal flux).
 - ii. The core loss.
 - iii. The magnetizing current.

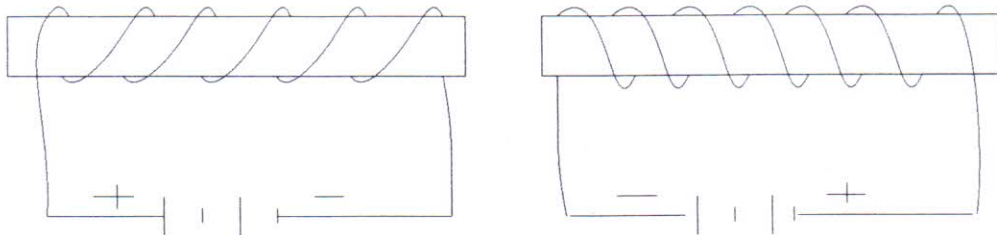
Question tow:

1. Choose the right answer:
 - a) According to Faraday's laws of electromagnetic induction an e.m.f. is induced in a conductor whenever it
 - i. Lies in a magnetic field.
 - ii. Cuts a magnetic flux.
 - iii. Lies perpendicular to the magnetic flux.
 - b) The direction of the dynamically induced e.m.f. may be found by applying
 - i. Fleming's rule.
 - ii. Flat-hand rule.
 - iii. Lenz's law
 - c) A three-phase four-wire system is commonly used on
 - i. Primary transmission.
 - ii. Secondary transmission
 - iii. Primary distribution.
 - iv. Secondary distribution.

2. Draw the schematic diagram of a 2-phase control motor and indicate on the drawing the reference phase (fixed phase) and the control phase.
3. An auto-transformer having 200 turns is connected to a 120 V a. c. supply as shown below. To obtain a 24-V output, find the number of turns of the secondary. If this auto-transformer is used to supply a load of 500 W, what should be the value of the current drawn from the supply.

Question three:

1. Choose the right answer:
 - a) Cables may be classified according to
 - i. The type of insulating material used in their manufacture.
 - ii. The voltage at which they transmit power.
 - iii. Both i & ii.
 - b) Transformer cores are laminated in order to
 - i. Simplify its construction.
 - ii. Minimize eddy current.
 - iii. Reduce cost.
 - c) In cables a metal sheath which made of lead or a lead alloy, is used to
 - i. Prevent entry of moisture into the inner parts of the cable.
 - ii. Protect the cable mechanically.
 - iii. None of the above.
2. For the following two electromagnets, shown below, explain and show how its polarities can be determined.



3. The efficiency at rated load of a 100 hp 600 V shunt motor is 85%. The field resistance is 190Ω and the armature resistance is 0.22Ω . The full-load speed is 1200 rpm. Find (a) the rated line current, (b) the field current, (c) the armature current at full load, and (d) the counter emf at full load.

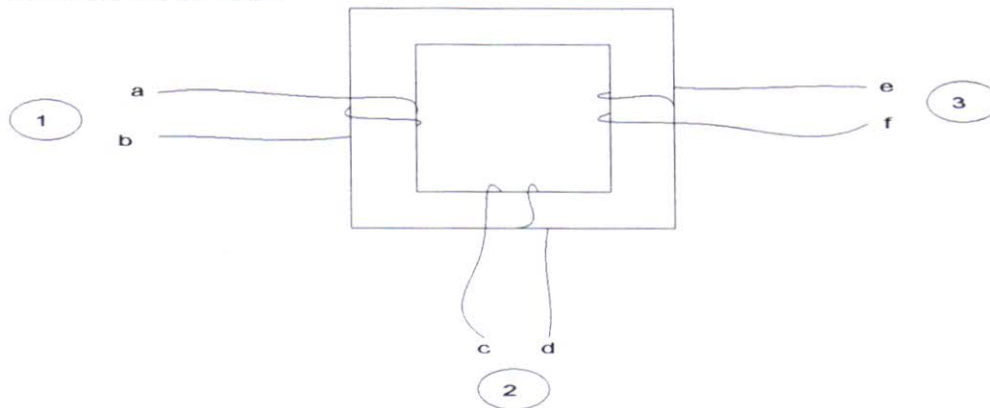
Question four:

1. Choose the right answer:
 - a) Step-down transformer decrease
 - i. Voltage.
 - ii. Current.
 - iii. Power.
 - b) For the given two conductors lies in space with radius r m for each and distance D m apart, the capacitance is given by

- i. $\frac{\pi \epsilon_0 \epsilon_r}{\ln \frac{D}{r}}$
- ii. $\frac{2\pi \epsilon_0 \epsilon_r}{\ln \frac{D}{r}}$
- iii. $\frac{\pi \epsilon_0 \epsilon_r}{2 \ln \frac{D}{r}}$

- c) In ferromagnetic materials, the relative permeability (μ_r) is
- i. In the range of 50 to 3000.
 - ii. Slightly more than one.
 - iii. Less than one.

2. Three coupled coils are wound on a core shown below. Redraw it by using the dot notation and by neglecting the resistances write the voltage equations of the two coils cd & ef.



3. Draw the single line diagram of a typical layout of a generating, transmission and distribution network of a system and show its elements.

Question five:

1. Choose the right answer:
- a) Transformers are rated in kVA instead of kW because.
- i. Load power factor is often not known.
 - ii. kVA is fixed whereas kW depends on load p.f.
 - iii. total transformer loss depends on volt-ampere.
- b) The phenomenon of raise in voltage at the receiving end of the open circuited or lightly loaded line is called the
- i. Seeback effect.
 - ii. Ferranti effect.
 - iii. Ramon effect.
 - iv. None of the above.

- c) % tage regulation of a transmission line is given by

- i. $\frac{V_R - V_S}{V_R^2} \times 100$.
- ii. $\frac{V_S - V_R}{V_R} \times 100$.
- iii. $\frac{V_S - V_R}{V_S} \times 100$.
- iv. $\frac{V_S - V_R}{V_R^2} \times 100$.

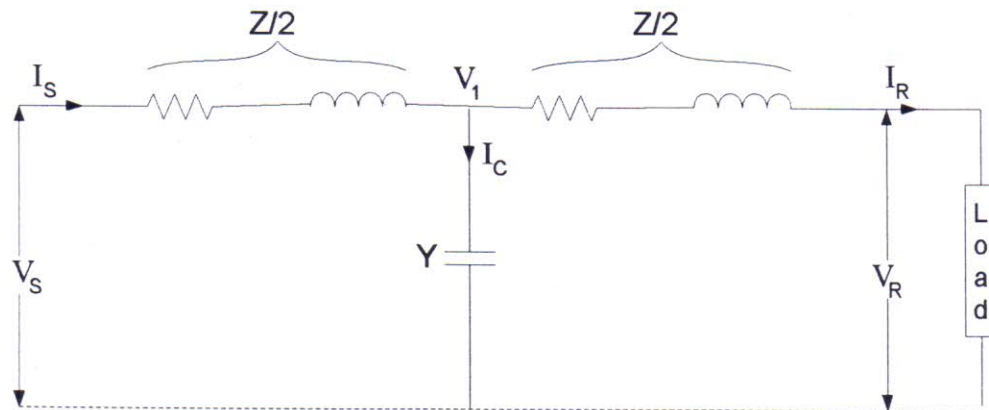
where, V_S sending voltage and V_R receiving voltage.

- The 3-phase 3-wire system may be delta-connected or star-connected. Draw this system in its delta & star connections, and write down the mathematical relations between its phase and line quantities (Voltage & Current).
- As you know for any 4-terminal network the sending-end voltages and currents per phase can be expressed by the following two equations

$$V_S = AV_R + BI_R$$

$$I_S = CV_R + DI_R$$

Where, A, B, C and D are the generalized transmission line constants, and V_R and I_R are the voltages and currents at the receiving-end. Show how the above two equations can be applied to the following network, which represents the medium transmission line in T form, and find the values of the generalized transmission line constants A, B, C and D .



Good luck