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JBLIC OF SOUTH AFRICA

T530(E)(A3)T
AUGUST 2010

NATIONAL CERTIFICATE

ELECTROTECHNICS N5

(8080085)

3 August (X-Paper)
09:00 – 12:00

Calculators may be used.

This question paper consists of 5 pages and a 2-page formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
ELEKTROTECHNICS N5
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Write neatly and legibly.

QUESTION 1

1.1 Briefly explain why the terminal voltage of a DC shunt excited generator drops as the current, supplied by the machine, is increased. (2)

1.2 What is the function of commutating poles and compensating windings in a DC machine? (2)

1.3 A DC motor with four poles has a wave-connected armature with 800 conductors. The brushes are displaced through five angular degrees from the geometrical axis. The armature current is 180 A.

Calculate the following:

1.3.1 The demagnetising and cross-magnetising ampere-turns per pole (4)

1.3.2 The additional field current required to neutralise this demagnetisation if the field winding has 1 800 turns/pole (2)

DRIE metodes om lekkasievloed in transformators te ...inder. (3)

Hoe kan werwelstroomverliese in 'n transformator verminder word? (1)

3.1.3 Neem 'n transformator enige stroom wanneer sy sekondêre in oopkring is? Gee 'n rede vir die antwoord. (3)

3.1.4 Verduidelik hoe ysterverliese geaffekteer word wanneer die frekwensie van 'n gegewe transformator verander. (1)

3.2 Die windingsverhouding van 'n enkelfasetransformator is 0,19 ohm onder-van die primêre en sekondêre windings is 0,8 ohm en 0,1 ohm skeidelik en die lekreaktansie van hierdie windings is 6,2 ohm onderskeidelik.

Bepaal die toegepaste primêre spanning wanneer 'n stroom van 20 A in die gekortsluite sekondêre winding vloei. Laat die magnitiseerstroom buite rekening. (10)
[18]

VRAAG 4

4.1 Bereken die induktansie en kapasitansie per fase van 'n 32 km-, driefase-oorhoofselyn met soliede kopergeleiers met 'n diameter van 0,9 cm wat gespasieer is op die hoeke van 'n driehoek met lengtes van 130 cm, 170 cm en 240 cm.

4.2 'n Oorhoofse enkelfasetransmissielyn lewer 200 kW teen 34 kV. Die arbeidsfaktor is 0,85 nalopend. Die totale weerstand van die lyn is 20 ohm en die totale induktiewe reaktansie van die lyn is 28 ohm.

Bepaal die volgende:

4.2.1 Die spanning aan die sendkant (5)

4.2.2 Die per eenheidregulering (2)

4.2.3 Die transmissierendement (3)

4.3 Elke tak van 'n driefase sterverbinde belasting bestaan uit 'n spoel met 'n weerstand van 4,5 ohm en reaktansie van 5,5 ohm. Die toevoer na die belasting is teen 'n lynspanning van 420 V, 50 Hz. Die drywing voorsien aan die las word met die tweewattmeter metode gemeet. Bereken hul afsonderlike lesings. (6)
[22]

QUESTION 5

5.1 Two similar, three-phase, star-connected alternators are connected in parallel. Each machine has a synchronous reactance of 9,5 ohms and negligible resistance. The machines are adjusted to be in exact opposition relative to each other and the excitation of one alternator is adjusted to give an open-circuit voltage of 2 950 V/phase and the circulating current of 65 A.

Calculate the following:

5.1.1 The open-circuit voltage of the other machine assuming it is less than that of the first machine (6)

5.1.2 The terminal line voltage (2)

5.2 A three-phase slip-ring induction motor gives a reading of 88 V across the slip-rings on open circuit with normal stator voltage applied. The rotor is star-connected and has an impedance of 0,9 + j 8 ohms per phase.

Determine the rotor current when the machine is:

5.2.1 At standstill with the slip-rings joined to a star-connected starter with phase impedance of 6 + j 8 ohms (3)

5.2.2 Running normally with 6,5% slip (3)

5.3

5.3.1 Is a single-phase induction motor self-starting? Give a reason for the answer. (2)

5.3.2 Name TWO methods used for finding the slip of the induction motor. (2)
[18]

TOTAL: 100