



Province of the  
EASTERN CAPE  
EDUCATION

**DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)**

**HOME SCHOOLING SELF-STUDY WORKSHEET**

<b>SUBJECT</b>	<b>POWER SYSTEMS</b>	<b>GRADE</b>	12	<b>DATE</b>	JUNE 2020
<b>TOPIC</b>	THREE – PHASE TRANSFORMERS AND MOTORS & STARTERS	<b>TERM 1 REVISION</b>	()	<b>TERM 2 CONTENT</b>	(√)
<b>TIME ALLOCATION</b>	2 hrs.	<b><u>TIPS TO KEEP HEALTHY</u></b>			
<b>INSTRUCTIONS</b>	Respond to all questions and pay attention to key aspects that are mainly asked.	1. <b>WASH YOUR HANDS</b> thoroughly with soap and water for at least 20 seconds. Alternatively, use hand sanitizer with an alcohol content of at least 60%. 2. <b>PRACTICE SOCIAL DISTANCING</b> – keep a distance of 1m away from other people. 3. <b>PRACTISE GOOD RESPIRATORY HYGIENE:</b> cough or sneeze into your elbow or tissue and dispose of the tissue immediately after use. 4. <b>TRY NOT TO TOUCH YOUR FACE.</b> The virus can be transferred from your hands to your nose, mouth and eyes. It can then enter your body and make you sick. 5. <b>STAY AT HOME.</b>			

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## QUESTION 1

- 1.1 Explain the function of a transformer in a distribution network.
- 1.2 List THREE requirements that must be satisfied for three single-phase transformers to be connected as a three-phase transformer.
- 1.3 Describe how an increase of the load will affect the primary current of a transformer.
- 1.4 Explain the purpose of the oil in a transformer.
- 1.5 Give THREE types of losses that occur in transformers.
- 1.6 A delta-star connected transformer supplies a factory with 85 kW of electrical power. The current is lagging the voltage with a phase angle of  $36,87^\circ$ . The total losses in the transformer are 12,5 kW. The primary line voltage is 13,8 kV and the secondary line voltage is 450 V.

Calculate:

- 1.6.1 The secondary line current.
- 1.6.2 The apparent power
- 1.6.3 The primary phase current

## QUESTION 2

- 2.1 State THREE advantages of squirrel cage induction motors when compared to other similar induction motors.
- 2.2 Give TWO applications of induction motors.
- 2.3 The stator of a three-phase induction motor driving a conveyor belt has 48 poles and the supply frequency is 50 Hz. Calculate the synchronous speed of the motor.

2.4 Draw TWO sketches of a terminal box of an induction motor and indicate a star connection on one and a delta connection on the other one.

2.5 Explain how the direction of rotation of a three-phase motor can be reversed.

2.6 List ANY of the important information shown on the name plate of a motor.

2.7 Describe why it is necessary to use a starter with induction motors.

2.8 In an electrical test to determine the insulation resistance of the windings, the megger was connected to the U2 and W1 terminals. The reading on the megger was  $35 \Omega$ . Conclude whether the motor can be activated or not.

2.9 As part of the electrical test, the megger was connected to terminals U1 and E. If the motor is in a good condition, what sort of reading can be expected?

2.10 The rotor speed of a squirrel cage induction motor is 3 384 rpm and the synchronous speed is 3 600 rpm. Calculate the slip.

2.11 The losses of a 25 kW squirrel cage induction motor amounts to 2,2 kW. Calculate the efficiency.

2.12 The following information appears on the nameplate of a squirrel cage motor:

Given:

Current = 20 A

Voltage = 415 V

Power factor = 0, 8

Efficiency = 90 %

Determine the maximum power the motor can deliver.