education

Department:
Education
REPUBLIC OF SOUTH AFRICA

ELECTRICAL TECHNOLOGY

EXAMINATION GUIDELINES

GRADE 12

2009

This guideline consists of 6 pages.

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INTRODUCTION

The examination guidelines for Electrical Technology provide learners and their teachers with minimum requirements scope for the final Grade 12 examination. The Department of Education provides schools with examination guidelines in order to prepare learners for the examination by outlining and explaining the minimum standards and content to be covered by all learners. These guidelines should be read in conjunction with the Subject Assessment Guidelines (SAG) and Learning Programme Guidelines (LPG).

These guidelines consist of two parts. Part A describes the topics and concepts covered by in the examination paper. Note that all three learning outcomes and their assessment standards are covered in their appropriate weighting. Part B outlines the sources used to set the questions. These learning materials include the textbooks used at schools. However, teachers are encouraged not to base their teaching and learning activities on a particular textbook, as this stifles learners' creativity and critical thinking.

PART A: TOPICS AND CONCEPTS COVERED BY THIS EXAM PAPER

LOs & Ass	TOPIC AND CONCEPTS	DESCRIPTION
LO 1	TECHNOLOGY, SOCIETY AND ENVIRONMENT **10**	• Positive and negative impact of technology on the environment • Entrepreneurial skills
LO 2	TECHNOLOGICAL PROCESS **10**	• Developing a solution within an electrical context, e.g sketching a block diagram of INPUT, PROCESS and OUTPUT • Specifications of the proposed design solution
LO 3, AS 1	OCCUPATION HEALTH AND SAFETY **10**	The understanding of unsafe acts and conditions. Awareness of HIV/AIDS. The above must be placed in the context of an electrical technology centre.
LO 3, AS 3	THREE-PHASE AC GENERATION **10**	The concept of three-phase systems as compared to single-phase systems which will include calculations. Recognition of star and delta systems, including phasor diagrams. Functions/purpose of the wattmeter, kilowatthourmeter and powerfactor meter.
LO 3, AS 4	R, L ,C CIRCUITS **30**	Calculations with reference to a phasor diagram or analysing of a phasor diagram followed by calculations of the required information. Calculations of both series and parallel circuits using only pure components in series & parallel circuits. The emphasis will be primarily on circuits containing only ONE resistor, ONE inductor and ONE capacitor. Calculation of inductive reactance, capacitive reactance and impedance Resonance in ac circuits Effects of the change in frequency to capacitive reactance, inductive reactance, impedance and current in ac circuits
LO 3, AS 6	SWITCHING AND CONTROL CIRCUITS **25**	The functional operation of the SCR, DIAC and TRIAC with characteristic curves. Operation of lamp dimming circuits using above components
LO 3, AS 7	AMPLIFIERS **25**	1. Characteristics of amplifiers 2. Bandwidth and feedback 3. Loadline 4. Different methods of operation 5. Oscillators: LC,RC, phase shift,etc

		Op-amps 1. Characteristics 2. Working principles of op-amps 3. The different modes of operation 4. Identify and draw circuits showing the different modes of operation with the input/output wave forms with the gain
LO 3, AS 8	THREE-PHASE TRANSFORMERS **15**	Explanation of the operation and use of three-phase transformers Explain the **connections** of three phase transformers. **Transformer calculations** to and from the load. **Concept and understanding** of losses Causes of heating and method to cool transformers
LO 3, AS 10	LOGIC CONCEPTS AND PLCs **35**	1. Introduction to PLCs 2. Advantages 3. Different programming languages (ladder, block and IL) 4. Operands 5. De Morgan's theorem 6. Combination logic circuits (simplify) 7. Karnaugh maps (max four terms) simplifying 8. Relay logic 9. Ladder-circuit ladder 10. Block diagrams 11. Sequential logic systems such as memory, shift register, timing diagrams
LO 3, AS 12	THREE-PHASE MOTORS AND CONTROL **30**	Operation of three-phase induction motor including calculations, fault finding and inspections. Identifying, explaining and comparing motor starters. Keeping with suggested starters.

WEIGHTING OF THE CONTENT

Total marks: 200

- One paper of 3-hour duration
- The emphasis of the external examination will be on LO3
  Some questions could be associated with the process of LO2
- ASs can also be integrated depending on the context.
- All questions must be answered
- Diagrams and sketches must be neat and labelled.
- Formula calculation, answer and unit must be indicated.

LOs & ASs	Concepts and content to be covered	Marks
LO1	Technology, Society and the Environment will be used to provide the content for the questions to be set.	10
LO2	The Technological process will provide a process in which the question will be set	10
LO3 AS1	OHS Act and regulations must be integrated where applicable	10
LO3 AS3	Three-phase AC generation	10
LO3 AS4	Effect of AC on series and parallel R, L and C component combination circuits	30
LO3 AS6	Operating principles of switching and control circuits	25
LO3 AS7	Output of amplifiers, their characteristics and feedback	25
LO3 AS8	Operations and use of three-phase transformers	15
LO3 AS10	Logic concepts as an introduction to programmable control	35
LO3 AS12	Operating principles and application of three-phase motors and control	30
	TOTAL	**200**

PART B: REFERENCE MATERIAL THAT MAY BE USED

Teaching and learning materials mentioned below form the basis from which explanations and discussions, as well as practical activities can begin. No single textbook or learning materials can meet the personal needs of each learner and educator. Therefore, it is imperative to use other sources to enhance deeper insight into a particular concept.

NO	NAME OF BOOK	AUTHOR	PUBLISHER/ISBN NO
1	Electrical Technology	Jan Randewijk & Raimund Swart	Guidelines ISBN-13 9781770172227
2	First steps in electronics book 3	E.Glasspoole	Shades Technical Publications ISBN 1-875033-02-5
3.	Hughes eighth edition	I Mckenzie Smith	Pearsons Education Limited ISBN 0582 40519X
4.	Design and technology 2nd Ed.	James Garratt	Cambridge University Press 0-521-64831-9
5	Electrical Trade Theory	C. du Preez	ISBN 007 04505742

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