CONTENT DEVELOPMENT AND CLASSIFICATION OF TEST ITEMS

CONTENT AREAS FOR ELECTRONICS

	Content Areas	Competencies	Descriptive statement
1	General Concepts and Definitions	1. Demonstrate a broad understanding of electronics 2. Demonstrate understanding and appreciation of the difference between electronics and electrical. 3. Demonstrate knowledge of the various forms of Emission in Electronic Systems. 4. Demonstrate board knowledge in the applications of Electronics. 5. Demonstrate the concept of thermionic emission in the design of a Cathode Ray Tube (CRT).	1. Define electronics. 2. Distinguish between Electronics and Electrical engineering 3. Distinguish between the various forms of emissions in electronic systems 4. Describe the various applications of Electronics in the real world. 5. Apply the concept of thermionic emission in the design of a Cathode Ray Tube (CRT).
2	Materials and Electronics Materials	1. Demonstrate knowledge of semiconductor materials 2. Demonstrate knowledge of the band theory. 3. Demonstrate knowledge of intrinsic and extrinsic semiconductors. 4. Demonstrate knowledge of N-type and P-type extrinsic semiconductor devices 5. Demonstrate knowledge of the application of a bridge rectifier as compared to a centre-tapped rectifier	1. Describe the properties of the various semiconductor materials and their applications in electronics. 2. Apply the band theory to distinguish between conductors, insulators, and semiconductor 3. Distinguish between intrinsic and extrinsic semiconductor devices. 4. Distinguish between the N-type and P-type extrinsic semiconductor devices. 5. Analyse the application of a bridge rectifier as compared to a centre-tapped rectifier

3	Passive Components	1. Demonstrate knowledge of passive components. 2. Demonstrate understanding of the various passive components 3. Demonstrate knowledge and understanding of KCL and KVL. 4. Demonstrate knowledge of Newman's, Thevenin's, and Superposition theorem in an electronic circuit.	1. Identify and describe the various passive components. 2. Describe the purpose of passive components in electronic circuits. 3. Apply KCL and KVL in solving circuit problems. 4. Exhibits knowledge of Newman's, Thevenin's, and Superposition theorem in solving circuit problems.
4	Active Components (Transistors)	1. Demonstrate knowledge of active components. 2. Demonstrate understanding of the various active components in electronic circuits. 3. Demonstrate knowledge in the application of transistors. 4. Demonstrate the operation of Silicon-Controlled Rectifier, DIACS, and TRIAC.	1. Identify and describe the various active components. 2. Describe the purpose of active components in electronic circuits. 3. Investigate the application of transistors (Oscillator Circuits, Electronic Switches, Compact Disc Players, Transistor Lasers). 4. Describe the operation of Silicon-Controlled Rectifier, DIACS, and TRIAC
5	Instrumentations	1. Demonstrate knowledge of measurement and measuring devices in electronics. 2. Demonstrate understanding of the usage of the various measuring instruments 3. Demonstrate knowledge and understanding of the measurement processes. 4. Demonstrate knowledge of the operational principles of the various measuring instruments.	1. Describe the various measuring instruments in electronics. 2. Distinguish between the usage of the various measuring instruments. 3. Explain the concept of measurements errors and their minimization 4. Analyse the mathematical principle behind the operation of the various measuring instruments.

6	Signals and Waves and Communication Technologies	1. Demonstrate knowledge of the generation and reception of electromagnetic signals. 2. Demonstrate knowledge of the concept of modulation and demodulation. 3. Demonstrate knowledge of the various components of the electromagnetic spectrum based on wavelength. 4. Demonstrate understanding of the electromagnetic waves 5. Demonstrate understanding of multivibrators. 6. Demonstrate knowledge of the various types of antennas. 7. Demonstrate knowledge of the concept of oscillators.	1. Identify components of a signal and recognize the parameters (frequency, time, amplitude, wavelength) of a signal. 2. Compare modulation and demodulation. 3. Categorize the various components of the electromagnetic spectrum based on wavelength. 4. Analyse the properties of electromagnetic waves and critique the side effects of E-M waves. 5. Differentiate between the various multivibrators (Astable, monostable and bistable). 6. Use the concept of omnidirectional and unidirectional antennas to solve Wifi challenges 7. Apply the concept of oscillators in the design of High-pass and low-pass filters
7	Sensors, Transducers, and Actuators	1. Demonstrate knowledge of the optimal use of sensors, transducers, and actuators. 2. Demonstrate knowledge of the applications of transducers. 3. Demonstrate knowledge and practical applications of actuators and sensors. 4. Demonstrate knowledge and understanding of photodiodes. 5. Demonstrate knowledge and understanding of thermistors.	1. Distinguish between sensors, transducers, and actuators. 2. Relate the usage of transducers in the conversion of light into electrical signals. 3. Apply the concepts of actuators and sensors in explaining how automated streetlights operate. 4. Critique the use of photodiodes in safety electronics such as fire and smoke detectors. 5. Explain the physical phenomena behind the operation of a thermistor used in electronics.

8	Digital Electronics	1. Demonstrate knowledge of digital number systems and their application. 2. Demonstrate knowledge and understanding of the various logic gates. 3. Demonstrate knowledge and understanding of digital circuits.	1. Investigate the application of number systems in digital electronics (for example in the cyclic Redundancy check). 2. Describe the various logic gates and as well as construct the truth tables of the various logic gates. 3. Construct digital circuits from Boolean algebra and vice versa.
9	IC Design	1. Demonstrate knowledge of Integrated Circuits. 2. Demonstrate knowledge of Operational Amplifiers (OP-Amps). 3. Demonstrate knowledge of the applications of Integrated Circuits.	1. Explain the Concept and importance of integrated circuits in circuit design. 2. Distinguish between Operational Amplifiers and Integrated Circuits. 3. Analyse the applications of Integrated Circuits.
10	Electronic Waste Disposal	1. Demonstrate knowledge of the best methods of electronic waste disposal. 2. Demonstrate knowledge of the various ways of disposing of electronic waste. 3. Demonstrate knowledge of the sustainability of electronic waste disposal methods. 4. Demonstrated knowledge of the environmental effect of non-compliance to global electronics waste disposal.	1. Describe electronics waste disposal. 2. Identify and explain the various ways of electronic waste disposal. 3. Assess the effectiveness of the various methods of electronic waste disposal 4. Analyse the environmental effect of non-compliance to global electronic waste disposal.

TABLE OF SPECIFICATIONS FOR ELECTRONICS (Depth of Knowledge)					
Content Areas	**Level 1** **RECALL**	**Level 2** **Skills and Concepts**	**Level 3** **Strategic Thinking**	**Level 4** **Extended thinking**	**Total**
1. General Concepts and definitions	1	2	3	3	9
2. Materials and Electronics Materials	1	4	3	2	10
3. Passive Components	1	3	3	4	11
4. Active Components (Transistors)	2	4	5	5	16
5. Instrumentations	2	2	4	4	12
6. Signals and Waves and Communication Technologies	2	3	4	3	12
7. Sensors/Transducers/ Actuators	1	3	3	3	10

8. Digital electronics	2	2	3	3	10
9. IC Design	2	1	1	2	6
10. Electronic Waste Disposal	1	1	1	1	4
TOTAL	**15**	**25**	**30**	**30**	**100**