 Province of the

EASTERN CAPE

EDUCATION

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

**HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET**

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| **SUBJECT** | **ELECTRONICS** | **GRADE** | 12 | **DATE** | JUNE 2020 |
| **TOPIC** | **SWITCHING CIRCUITS** | **TERM 1**  **REVISION** | (Please tick) | **TERM 2 CONTENT** | (√ ) |

**QUESTION 1**

**1.1 Multivibrator**

1.1.1Mono-stable multivibrator

**1.1.2 TWO characteristics of this multivibrator.**

* It has ONE input.
* It has ONE stable state.

**1.1.3 Function of the network C2 and R2.**

* The RC network in this circuit is the timing component of this circuit.
* The values of the resistor and the capacitor. determine for how long the circuit will be in the HIGH ✓state before it reverts back to its stable LOW state.

**1.1.4 THREE ways to change this circuit in order to have a variable time in the high state.**

* By changing R2 from a fixed resistor value to a variable resistor.
* By changing the value of C2 from a fixed value capacitor to a variable capacitor ✓
* By changing both R2 and C2 from fixed values ✓ to variable values ✓

1.1.5 **Operating principle:**

* When the circuit is in resting condition, the negative voltage of -Vref on the inverting input serves to hold this inverting input low ✓
* This will cause the Op-Amp to saturate and the output to rise to and stay at +15 V
* The capacitor, C, charges up with the top plate to + 15 V, and the bottom plate to 0 V
* When the capacitor is charged, no current flows through R as there is no voltage over it. This holds the non-inverting input at 0 V.
* A positive trigger pulse larger than Vref applied to the inverting input terminal will raise the inverting input potential above the 0 V of the non-inverting input.
* The Op-Amp will now saturate and the output will go to -15 V.
* The capacitor will now immediately start discharging through the resistor Rf.
* The lower plate of the capacitor rises to 0 V and when the voltage is less negative than Vref, the output changes to +15 V again

1.1.6 Debouncing.

**1.2 Multivibrator**

1.2.1 At one end the potentiometer will be connected to 0 Ω. ✓ R1 will prevent the full supply flowing to pin 6 and 7, when the potentiometer is in the 0 Ω position

1.2.2 By changing the value of C1 ✓

By changing the value of R3 ✓

1.2.3 The time period will increase ✓

**1.3** **A fully labelled circuit diagram of an Op-Amp Astable multivibrator circuit**.

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1.4 **A fully labelled hysteresis characteristic curve**

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1.5 The time lag (delay) between cause ✓ and effect ✓

**1.6 TWO applications of the Schmitt trigger.**

* First stage of many radio receivers to clean up noise ✓
* To eliminate switch bounce in digital circuits ✓
* Varying input waveforms, for instance sine wave changed into square wave or rectangular wave
* Signal recovery after experiencing severe distortion

(Any 2)

**4.7 A labelled circuit diagram of a temperature sensor circuit.**

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**4.8** **A summing amplifier with THREE inputs.**

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1.9 **A summing amplifier has three input resistors with the following values:**

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