



L-Università
ta' Malta

MATSEC
Examinations Board



Marking Scheme

SEC Engineering Technology Unit 3

Main Session 2021

20th May 2021

Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with the MATSEC Examinations Board when in doubt.

Marking Scheme (Main Session 2021): SEC Engineering Technology Unit 3

Criteria Reference	The student should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks	Examples of expected answer
K-1.	Identify different electronic components from their schematic, pictorial and real life representation.	1	4 marks	0.25 marks for each correct answer.	(a) Battery (b) Single-Pole Single-Throw (SPST) switch (c) Light Emitting Diode (LED) (d) Capacitor (e) AND logic Gate (f) Light Dependent Resistor (LDR) (g) Motor (h) Transistor (i) Motor (j) Bulb (k) Ic base (l) Solar cell (m) Buzzer (n) 555 timer (o) Resistor (p) Relay
C-2.	Interpret characteristic curves of individual components.	2	6 marks	(a) 0.5 marks for each correct answer. (b) 1 mark (c) (i) 1 mark (ii) 1 mark	Examples of accepted answers. (a) Curve 2 - Diode Curve 3 – Transistor (b) For an ideal resistor, the relationship between voltage and current is linear and constant (0.5 marks) with a constant of proportionality $1/R$ (Ohm's Law) (0.5 marks). (c) (i) The voltage potential is connected positive to the P-type material and negative to the N-type material across the diode

Marking Scheme (Main Session 2021): SEC Engineering Technology Unit 3

				<p>(d) (i) 1 mark</p> <p>(ii) 1 mark</p>	<p>(ii) A small amount of current starts to flow but after the knee voltage (0.7 for Si), the current flow rises sharply/exponentially and the diode conducts heavily. In this region the thickness of the depletion layer reduces, allowing the diode to act like a short circuit.</p> <p>(d) (i) In the saturation region the transistor tends to behave as a closed switch (short circuit) (0.5 marks). The collector and emitter currents are maximum in this region (0.5 marks).</p> <p>(d) (ii) In this region the transistor will operate as an amplifier $I_c = \beta I_B$ (0.5 marks). The BE junction is forward biased and the BC junction is reverse biased (0.5 mark).</p>
K-4.	Predict the value of components in a circuit by using basic laws of electricity.	3	4 marks	<p>(a) 1 mark</p> <p>(b) 1 mark</p> <p>(c) 1 mark</p> <p>(d) 1 mark</p>	<p>(a) total resistance 120 Ω. (0.25 marks for the correct working) Current = 0.1 A (0.25 marks for the correct working) Voltage across R2 = 6 V (0.5 marks for the correct working)</p> <p>(b) Total resistance 8 Ω (0.25 marks for the correct working) Current = 2 A (0.25 marks for the correct working) Power = 32 W (0.5 marks for the correct working)</p> <p>(c) $t = RC$ $R = \frac{t}{C} = \frac{47}{1000u} = 47000\Omega = 47 K\Omega$</p> <p>(d) $C = C1 + C2$ $C1 = C - C2$ $C1 = 1000u - 680u = 320uF$</p>

Marking Scheme (Main Session 2021): SEC Engineering Technology Unit 3

K-5.	Identify tools and equipment used to construct circuits.	4	4 marks	0.5 marks for each correct answer.	<p>(a) Long nose pliers; (b) Wire stripper; (c) Soldering iron; (d) Helping Hands / Third hand (e) Solder wick; (f) Side cutter; (g) De-soldering pump; (h) Track cutter;</p>
C-5.	Identify the advantages and disadvantages of electronic boards.	5	6 marks	<p>(a) 2 marks (1 mark for the advantage & 1 mark for the disadvantage).</p> <p>(b) 2 marks (1 mark for the advantage & 1 mark for the disadvantage).</p>	<p>(a) Examples of correct answers: Breadboard: Advantages –</p> <ul style="list-style-type: none"> • The breadboard can be reused. • No need to solder components. • Replace componets quickly. • Components not damaged by heat. • Useful when dealing with ICs. • Easy to assemble components. <p>Disadvantages –</p> <ul style="list-style-type: none"> • Surface mount components cannot be used. • Do not perform well with high frequencies. • Cannot withstand high voltages. • Cannot withstand high currents. • Many jumpers required. <p>(Accept any 1 advantage and 1 disadvantage for each)</p> <p>(b) Examples of correct answers: Strip Board: Advantages –</p> <ul style="list-style-type: none"> • They cost significantly less than a PCB. • Easier to modify a circuit on stripboard rather than PCB. • Stripboards are easily available. • Cleaner method of production. • Fairly quick to prototype.

				<p>(c) 2 marks (1 mark for the advantage & 1 mark for the disadvantage).</p>	<p>Disadvantages –</p> <ul style="list-style-type: none"> • Labour intensive if building more than one unit. • Layout would not be as compact as that built on a PCB. • Prone to building errors. <p>(Accept any 1 advantage and 1 disadvantage for each)</p> <p>(c) Example of correct answers: PCB:</p> <p>Advantages –</p> <ul style="list-style-type: none"> • Mass produced at low cost. • Fixed components. • Minimize short circuits. • Easy to solder. <p>Disadvantages –</p> <ul style="list-style-type: none"> • Complicated to repair (with no schematic diagram). • Production causes environmental degradation. • Fixed for specific use. <p>(Accept any 1 advantage and 1 disadvantage for each)</p> <p>Any other answers which make technical sense should be accepted.</p>
--	--	--	--	--	---