L-Università ta' Malta

MATSEC
Examinations Board

Marking Scheme

SEC Engineering Technology Unit 3

Main Session 2019

9th April 2019

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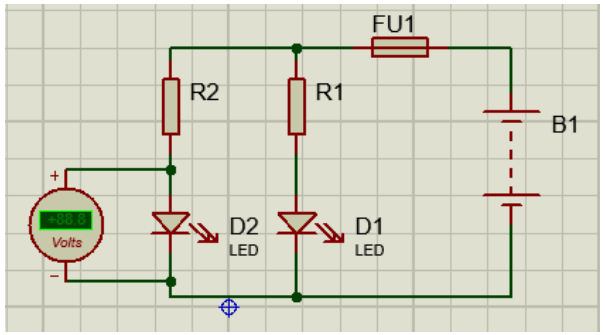
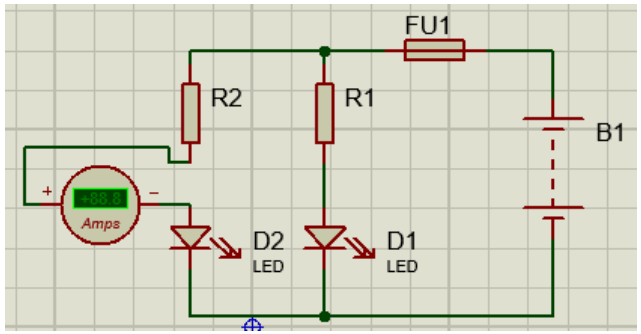
Criteria Reference	**The student should be able to:**	**Question Number**	**Maximum marks that can be achieved**	**Allocation of marks**	**Examples of correct answers**
K-1.	Identify different electronic components from their schematic, pictorial and real life representation.	1	4 marks	1/2 mark for each correct answer	(a) Single Pole Double Throw (SPDT) switch (b) Capacitor (c) Light Emitting Diode (LED) (d) Transistor (e) Resistor (f) OR Gate (g) Inductor (h) NAND Gate
K-4.	Predict the value of components in a circuit by using basic laws of electricity.	2	4 marks	(a) 2 marks (b) 2 marks	(a) total resistance 80 Ω. (1 mark) Equation of resistors in series (0.5 marks) R3 =20 Ω. (0.5 marks) (b) Total resistance 5Ω (1 mark) Proper equation of power (0.5 marks) Voltage = 12V (0.5 mark)
C-2.	Interpret characteristic curves of	3	6 marks		Examples of accepted procedures and accepted definitions.

	individual components.			(a) 0.5 mark (b) 0.5 mark (c) 0.5 mark (d) (i) 1 mark (ii) 1 mark (e) (i) 0.5mark (ii) 1 mark	(a)Graph C (b)Graph A (c) Graph B (d) (i) Voltage in the negative direction (Until reverse breakdown) does not result in current flow (except for the small amount of current called reverse saturation current). The depletion layer widens. (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 chort circuit. (e) (i)V_{CE} is the Collector Emitter Voltage. (ii)In this region the transistor will operate as an amplifier (1/2mark). Here the BE junction is forward biased and the BC junction is reversed biased (1/2 mark). (iii) In this region the transistor will be off(acting like an open circuit) (1/2 marks). No collector current will be passing, which imples that no emitter current will pass (1/2 marks)

				(iii) 1 mark	
K-4.	Predict the value of components in a circuit by using basic laws of electricity.	3	4 marks	(c) 2 marks (d) 2 marks	(c) total resistance 80 Ω. (1 mark) Equation of resistors in series (0.5 marks) R3 =20 Ω. (0.5 marks) (d) Total resistance 5Ω (1 mark) Proper equation of power (0.5 marks) Voltage = 12V (0.5 mark)
K-5.	Identify tools and equipment used to construct circuits.	4	4 marks	1/2 mark each	(a) Soldering iron; (b) Track cutter; (c) Wire stripper (automatic); (d) Side cutter; (e) Long nose pliers; (f) De-soldering pump; (g) Solder wick; (h) Helping Hands / Third hand.

C-4.	Justify the use of test bench equipment in relation to different scenarios.	5	6 marks	(a) 1 mark (b) 2 marks (c) 1 mark (d) 2 marks	(a) Oscilloscope Since the audio frequency is between 20Hz and 20 kHz (b) Voltage Amplitude Periodic Time Maximum and Minimum Voltages Rise Fall time (Any two answers are accepted – 1 mark for each correct answer) (c) Multimeter (d) A multimeter can be used to take readings of: current voltage resistance capacitance

					(Any two answers are accepted – 1 mark for each correct answer)
K-7.	Describe basic voltage, current and resistance tests.	6	4 marks	(a) (i)1 mark (ii)1mark	(a) Example of a correct answer: (i)The multimeter should be set on the voltage DC (range of 20V, assuming lowest range is 200m and next one is 2V) The black terminal should be connected to the cathode of the LED (D2) while the positive terminal to the anode of D2. (ii) the multimeter is drawn connected across D2. 

				(b) (i) 1 mark (ii) 1 mark	(b) Example of a correct answer: (i) the multimeter should be set to current DC (on the mA range) and the red terminal shold be placed in the mA port. The anode(or cathode) of the LED shold be disconnected and the current meter should be placed in series where the disconnection was carried out. Polarity should be observed to ensure the current value is positive. (ii) the multimeter is drawn connected in series with D2. 

C-5.	Identify the advantages and disadvantages of electronic boards.	7	6 marks	(a) 3 marks	(a) Example of a correct answer: **Advantages –** The breadboard can be reused. No need to solder components. Replace componets quickly. Components not damaged by heat Useful when dealing with Ics. **Disadvantges –** Do not perform well with high frequencies. Cannot withstand high voltages. Cannot withstand high currents. Many jumpers required. Surface mount components cannot be used. (2 advantages and 1 disadvantage need to be mentioned)
				(b) 3 marks	(b) Example of a correct answer: **Advantages –** Low cost. Fixed components. Minimize short circuits.

					Easy to solder. **Disadvantages –** Complicated to repair (with no schematic diagram). Prodcution causes environmental degradation. Fixed for specific use. (2 advantages and 1 disadvantage need to be mentioned) Answers which make technical sense should be accepted.

K-10.	Describe the soldering processes for prototypes and mass produced circuits.	8	4 marks	(a) 0.5 mark for each step (b) 0.5 mark for each step	(a) Student needs to list the following items: 1) Make sure components and pads are clean. 2) Heat the pad and the component lead. 3) Apply enough solder and allow it to flow. 4) Remove the solder and soldering iron and allow joint to cool down. (b) Steps 1) Silk Screening 2) Surface Mount components 3) Soldering baths 4) Robotic assembly