



**L-Università  
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE  
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL  
2020 MAIN SESSION**

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SUBJECT:	<b>Engineering Technology</b>
PAPER NUMBER:	Controlled – Unit 2
DATE:	22 <sup>nd</sup> May 2019
TIME:	10:00 a.m. to 11:35 a.m.

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**THIS PAPER SHOULD BE RETURNED TO THE INVIGILATOR  
AFTER THE EXAMINATION.**

**Name of candidate** \_\_\_\_\_

**I.D. number** \_\_\_\_\_

**School** \_\_\_\_\_

**Class** \_\_\_\_\_

Answer **ALL** questions in the space provided. The use of non-programmable electronic calculators is allowed.

**Scenario**

An oil drilling company is designing a new drilling rig using modern technologies. As a test to assess your knowledge, the management has issued the following questions.

**Question 1**

**K4 (4 marks)**

Smart materials are able to change their properties when externally stimulated. Fill in the table below to identify and describe the smart materials or the respective functions.

Table 1 – Smart Materials

	<b>Smart Material Type</b>	<b>Function</b>
(a)		A material that returns to its pre-deformed shape when heated.
(b)	Self-healing material	
(c)		A material that is able to generate electricity when a mechanical force is applied.
(d)	Magnetic shape memory material	

(4)

**Question 2**

**C2 (6 marks)**

For part of the oil rig, different materials and processes will be used to ensure durability of the parts. Also all the furniture on the oil rig will be custom made by the same company.

(a) Explain the procedure for carrying out hardening in the metallurgy industry.

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(1½)

(b) Galvanizing is an important process related to the production of metal parts.

(i) Explain how the process of galvanizing is carried out.

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(1½)

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(c) Explain a process used to season wood.

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(1½)

(d) Explain briefly how thermoplastic products are formed by using the injection moulding process.

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(1½)

**Question 3**

**K5 (4 marks)**

Different testing procedures are adopted to test material properties. Outline the procedures required to carry out the tests properly by completing Table 2. The first one has been done for you.

Table 2 – Tests carried out to measure material properties.

	<b>Test</b>	<b>Outline of procedure required to carry out the test properly.</b>
	Temperature of a liquid	Temperature can be measured by using a mercury thermometer. The thermometer is placed in the liquid and swirled around, without touching the container. This is continued until the temperature indication on the thermometer stops changing. At this point the level of the mercury inside the thermometer is read against a scale which indicates the temperature of the liquid.
(a)	Impact test of mild steel	(2)
(b)	Torque test of a steel bolt	(2)

***Please turn the page.***

**Question 4**

**C3 (6 marks)**

The company is required to ensure that the parts used in the oil rig are durable. Thus, tests will be conducted to ensure that these comply with established standards. Table 3 below shows four components that will be required for this rig. Justify the test that needs to be conducted for each of the given materials. The first one has been done for you.

Table 3 – Different testing scenarios

	<b>Material</b>	<b>Test to be carried out</b>	<b>Justification of Test</b>
	A metal is used to make a tool which is then used in a lathe to work on other metals. Testing is required to ensure that the material selected to make the tool will be able to last for a long time when in use.	Hardness testing	Hardness testing measures the resistance of the metal to suffer permanent shape changes with the application of a compressive force. The harder the material the more it will last when used as a tool on other materials.
(a)	Steel bolts are used in a bridge to bond metal beams together. The metal used to manufacture these bolts needs to be tested to ensure that they are of the correct strength.	(1/2)	(1)
(b)	A concrete slab needs to be tested to ensure that it is strong enough to support the weight of the structure.	(1/2)	(1)

(c)	A wooden beam will be used to support a roof. The material used needs to be tested to ensure that it is strong enough to support the load on the roof.	(1/2)	(1)
(d)	Metal bars will be fitted as handrails on the oil rig. The material used to construct them needs to be tested to ensure that it is fit for purpose.	(1/2)	(1)

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**Question 5****K6 (4 marks)**

During the manufacturing process, different materials, which come in different forms of supplies will be used. By filling in Table 4, identify **TWO** possible forms of supply for **EACH** material.

Table 4 – Forms of Supply

	<b>Type of material</b>	<b>Possible form of supply</b>
(a)	Wood	
(b)	Metal	

(4)



**Question 6**

**K9 (4 marks)**

Power tools and machinery will be used during the manufacturing of the parts required for the oil rig. Each tool has its appropriate function and use. By completing Table 5 below, outline the function of each tool and machinery listed. The first one has been done for you.

Table 5 – Functions of Power Tools/Machinery

<b>Name</b>	<b>Function</b>
Angle Grinder	An angle grinder is a handheld power tool. It is used for grinding, polishing and cutting by abrasive cutting.
(a) Jigsaw	
(b) Cross cut	
(c) Driller	
(d) Hot air blower	

(4)

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**Question 7**

**K10 (4 marks)**

To ensure proper function, tools need to be well maintained. Describe **ONE** aspect for the appropriate use, and **ONE** aspect for maintenance and care procedures of each of the tools given below.

(a) Micrometer.

(i) Use

(1)

(ii) Maintenance and Care

(1)

(b) Band Saw.

(i) Use

(1)

(ii) Maintenance and Care

(1)

**Question 8**

**C5 (6 marks)**

For this question you are to select and answer only **ONE** of the options, **either** Option A **or** Option B.

**Option A**

The piston shown in Figure 1 needs to be manufactured as part of an engine.



Figure 1- Piston.

Source: <http://www.globalsources.com>

Choose the tools required to produce the piston, justifying their use in the manufacturing process.

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(6)

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**Option B**

The wooden table shown in Figure 2 needs to be manufactured.



Figure 2- Wooden Table

Source: <http://howtospecialist.com/>

Choose the tools required to produce the table, justifying their use in the manufacturing process.

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