**0171-516 JUNE 2019**  
**Level 3 Advanced Technical Extended Diploma in Land-Based Engineering (1080)**  
**Level 3 Land-Based Engineering – Theory exam (1)**

**Candidate name (first, last)**  
**First**

**Last**

**Candidate enrolment number**  
**Date of birth (DDMMYYYY)**

**Gender (M/F)**

**Assessment date (DDMMYYYY)**

**Centre number**

**Candidate signature and declaration**

*If additional answer sheets are used, enter the additional number of pages in this box.  
Before taking the examination, all candidates must check that their barcode label is in the appropriate box. Incorrectly placed barcodes may cause delays in the marking process.  
Please ensure that you staple additional answer sheets to the back of this answer booklet, clearly labelling these with your full name, enrolment number, centre number and qualification number in BLOCK CAPITALS.  
All candidates need to use a black/blue pen. Do not use a pencil or gel pen, unless otherwise instructed.  
If provided with source documents, these documents will not be returned to City & Guilds, and will be shredded. Do not write on the source documents.  
*I declare that I had no prior knowledge of the questions in this examination and that I will not divulge to any person any information about the questions.*

You should have the following for this examination  
• a pen with blue or black ink  
• a non-programmable calculator

**General instructions**  
• Use black or blue ball-point pen.  
• The marks for questions are shown in brackets.  
• This examination contains 12 questions. Answer all questions.  
• Answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.  
• Cross through any work you do not want to be marked.
1 Identify the components labelled A, B and C in Figure 1. (3 marks)

Figure 1

Source: http://free-ed.net/sweethaven/mechtech/automotive01/

A  
B  
C  

2 a) Describe two functions of an ABS braking system. (2 marks)

b) Describe two working principles of an ABS braking system. (2 marks)
Describe **five** working principles of a hydrostatic steering system. (5 marks)
4 a) How much current will be drawn through the 2 Ohm resistor shown in Figure 2? Show all workings. (3 marks)

![Figure 2](https://www.allaboutcircuits.com/textbook/direct-current/chpt-5)

b) What is the total resistance value offered by the circuit? (2 marks)

______________________________
______________________________
______________________________
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Identify the components labelled A, B and C in Figure 3.

(3 marks)

Source: https://www.pinterest.co.uk/pin/339107046927087361/

Figure 3

A

B

C
6 Figure 4 lists the specific gravity readings taken by a hydrometer for a 12 V lead acid battery.

<table>
<thead>
<tr>
<th>Cell 1</th>
<th>1.225</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell 2</td>
<td>1.125</td>
</tr>
<tr>
<td>Cell 3</td>
<td>1.280</td>
</tr>
<tr>
<td>Cell 4</td>
<td>1.100</td>
</tr>
<tr>
<td>Cell 5</td>
<td>1.280</td>
</tr>
<tr>
<td>Cell 6</td>
<td>1.270</td>
</tr>
</tbody>
</table>

**Figure 4**

Referring to Figure 4, analyse the findings and determine the state of charge of the battery. 

7 Describe the role of an electronic monitoring and control system on a modern engine fitted to a land-based machine.
8 A tractor with a common rail engine has gone into limp mode. What parameters could be monitored during the fault diagnostic process? (4 marks)

9 a) Identify the types of signals labelled A and B in Figure 5. (2 marks)

b) What type of waveform is displayed in B in Figure 5? (1 mark)
10 Explain the working principles of the components that make up a hydrostatic transmission system. (7 marks)
11 a) Identify the components labelled A, B and C in Figure 6. (3 marks)

Figure 6

A
B
C

b) Referring to Figure 6, describe what would happen if the cylinder reached the end of its travel and flow continued? (2 marks)


Source: http://www.hydraulicstatic.com/
12 A tractor has a CANBus fault code showing on the display and will not start. The picture on the display indicates an open circuit on the CAN network. Discuss the preparation stages, resources and steps required to carry out a full diagnostic assessment of the CAN system. (12 marks)