



0171-523 MARCH 2019

Level 2 Technical Certificate in Land-Based Engineering

Level 2 Land-Based Engineering – Theory Exam

Friday 15 March 2019
09:30 – 11:30

You should have the following for this examination

- a multiple-choice answer sheet
- a pen with black or blue ink

This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.

Read the following notes before you answer any questions

- You **must** use a pen with black or blue ink to complete **all** parts of the answer sheet.
- Check that you have the correct answer sheet for the examination.
- Check that your name and candidate details are printed correctly at the top of your answer sheet.
- Inform the invigilator if your name or examination details are not correct.
- Each question shows **four** possible answers (lettered 'a', 'b', 'c' and 'd'); only **one** is correct.
- Decide which **one** is correct and mark your answer on the **answer sheet** with your pen.

For example if you decide 'a' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> (b)	<input type="radio"/> (c)	<input type="radio"/> (d)
	Cancel	Cancel	Cancel	Cancel

If you want to change your answer, cancel your first choice by filling in the 'cancel' box below the circle like this

101	<input checked="" type="radio"/>	<input type="radio"/> (b)	<input type="radio"/> (c)	<input type="radio"/> (d)
	Cancel	Cancel	Cancel	

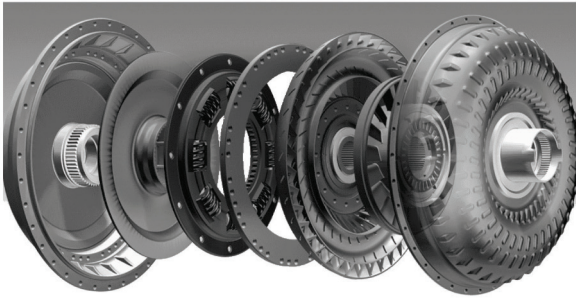
Then mark the answer which you have now decided is correct. For example if you now decide 'c' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> (b)	<input checked="" type="radio"/>	<input type="radio"/> (d)
	Cancel	Cancel	Cancel	

Any other marks on the form may invalidate some of your answers.

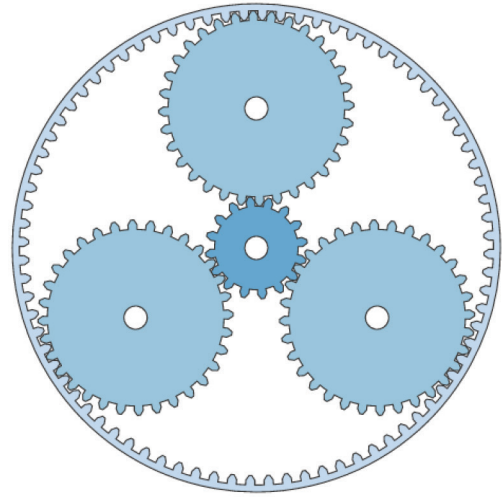
- Any calculations or rough working can be done on the question paper.
- Attempt all questions. If you find a question difficult, leave it and return to it later.

This paper contains 50 questions. Answer them using the 'boxes' numbered 1 to 50 on the answer sheet.



<https://theaerospacenews.com>

Figure 1



<https://bl.ocks.org/mbostock/1353700>

Figure 2

- 1 Which one of the following items is shown in Figure 1?
 - a A single plate clutch.
 - b A torque multiplier.
 - c A multi plate clutch.
 - d A torque convertor.

- 2 One purpose of a flywheel in a transmission is to
 - a stop transmission judder
 - b turn the input shaft
 - c stop transmission wind up
 - d turn the output shaft.

- 3 Before working on any part of a transmission, the technician should ensure that
 - a the machine is on flat level ground and chocked
 - b there is sufficient oil in the gear box
 - c the transmission is engaged in gear
 - d the transmission is disconnected from the power supply.

- 4 Which one of the following items is shown in Figure 2?
 - a An internal gearbox.
 - b A differential lock.
 - c An epicyclic unit.
 - d A transfer gearbox.

- 5 A semi-powershift transmission jumps sharply when releasing the clutch.

Which one of the following is a possible fault?

- a The clutch packs are worn.
 - b The clutch packs are cold.
 - c The clutch packs are hot.
 - d The clutch packs are new.
-
- 6 After re-assembly, why should a technician ensure there is a backlash measurement on a differential?
 - a To ensure the differential teeth mesh correctly.
 - b To ensure the pinion shaft is pre-loaded.
 - c To ensure the differential lock operates.
 - d To ensure the bearings are pre-loaded.

 - 7 A customer reports that when the clutch pedal is pressed on their tractor, it travels all the way down and stays there.

Which one of the following is a possible fault?

- a Worn release bearing.
- b Leaking master cylinder.
- c Contaminated friction plate.
- d Incorrectly adjusted release fork.

- 8 What is the purpose of the low pressure line in a diesel fuel injection system?
- To supply the injectors with fuel.
 - To supply the fuel return with fuel.
 - To supply the high pressure pump with fuel.
 - To supply the high pressure fuel leak-off with fuel.



<https://www.fruugo.co.uk>

Figure 3

- 9 Which one of the following items is labelled A, in Figure 3?
- Governor spring.
 - Injector opening spring.
 - Valve return spring.
 - Injector return spring.
- 10 In a spark ignition engine, which one of the following will create combustion?
- Injecting diesel into compressed air.
 - Igniting the petrol/air mixture with a spark.
 - Injecting petrol into compressed air.
 - Igniting the diesel/air mixture with a spark.
- 11 A four cylinder, four stroke in-line engine has a firing order of 1, 3, 4, 2.
- If cylinder number 2 has just fired then cylinder number 1 will be on the
- compression stroke
 - induction stroke
 - exhaust stroke
 - power stroke.

- 12 Which one of the following is the **main** purpose of a cylinder block?
- To house the combustion chamber.
 - To guide the valve stems.
 - To house the engine oil.
 - To guide the pistons.

- 13 A customer has reported that the engine will not start after changing the fuel filters on their tractor.

Which one of the following is a possible fault?

- Air in the fuel tank.
 - Air in the low-pressure system.
 - Fuel in the leak off.
 - Fuel in the low-pressure pump.
- 14 An engine has failed a compression test. Which one of the following is used to confirm the fault?
- A pressure test.
 - A leak test.
 - A flow test.
 - A load test.
- 15 A farmer has reported that the engine on their tractor quickly overheats when running. Which one of the following is the **most** likely fault?
- There is not enough coolant in the system.
 - There is too much coolant in the radiator.
 - The water pump is rotating too fast.
 - The thermostat has stuck open.
- 16 When completing a compression test on a compression ignition engine, why is it important to remove all of the injectors?
- To stop the engine from overheating.
 - To check the conditions of all the injectors.
 - To stop the engine from firing on cranking.
 - To prevent the injectors from being damaged.
- 17 Which one of the following is found on a starter motor removal risk assessment?
- Ensure the battery is connected.
 - Ensure the battery is disconnected.
 - Ensure the battery is fully charged.
 - Ensure the battery is fully discharged.



Figure 4

18 Which one of the following components is shown in Figure 4?

- a An alternator.
- b A battery.
- c A starter.
- d A motor.

19 Which one of the following units is used to measure electrical force?

- a Amps.
- b Watts.
- c Ohms.
- d Volts.



Figure 5

20 Which one of the following symbols is shown in Figure 5?

- a A bulb.
- b A fuse.
- c A switch.
- d A capacitor.

21 Which one of the following is the **first** step when disconnecting a battery?

- a Disconnect the positive.
- b Disconnect the negative.
- c Disconnect the solenoid positive.
- d Disconnect the solenoid negative.



Figure 6

22 Which one of the following symbols is shown in Figure 6?

- a Terminal.
- b Starter.
- c Cell.
- d Bulb.

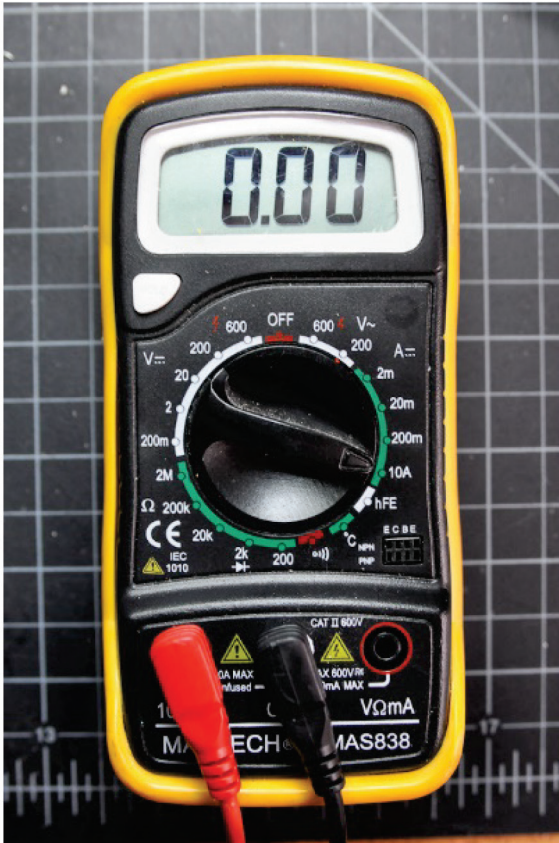
23 After testing a 12 V battery with a multimeter, the reading is 2.5 V.

Which one of the following is **most** likely to have the fault?

- a The alternator.
- b The terminal.
- c The fuse.
- d The cells.

24 Which one of the following items assist a pre-engaged starter pinion to engage with the ring gear on cranking?

- a A commutator.
- b A bridging link.
- c A bendix gear.
- d An overrun clutch.



<https://gltnhs-tle.weebly.com/lesson-25.html>

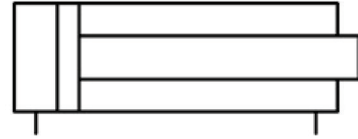
Figure 7

25 Which one of the following electrical units is the multimeter set to read in Figure 7?

- a Watts.
- b Volts A/C.
- c Amps.
- d Volts D/C.

26 Hydraulic oil is stored in the

- a filter
- b sump
- c pump
- d reservoir.



<https://commons.wikimedia.org>

Figure 8

27 Which one of the following hydraulic symbols is shown in Figure 8?

- a Single acting cylinder.
- b Double acting ram.
- c Double acting cylinder.
- d Single acting ram.

28 After working on a hydraulic system, which one of the following is responsible for signing a job card?

- a The engineer.
- b The sales advisor.
- c The parts manager.
- d The workshop manager.

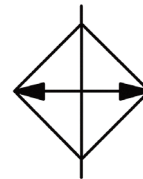


Figure 9

29 Which one of the following hydraulic symbols is shown in Figure 9?

- a A filter.
- b An oil cooler.
- c An air cooler.
- d A heater.

30 Which one of the following **must** be carried out before removing any part of a hydraulic system?

- a Ensure that the oil has cooled.
- b Check that the oil filter is correctly fitted.
- c Ensure that the pressure has been released.
- d Check that the pipes have been removed.

31 **Statement 1**
A double acting cylinder operates in both directions.

Statement 2
Double acting cylinders will retract quicker, than extend.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	False
b	False	True
c	False	False
d	True	True

32 During a pressure and flow test of a hydraulic pump, it is noted that there is flow but no pressure.

Which one of the following is the **most** likely cause?

- a The hydraulic oil filter is blocked.
- b The pressure relief valve is stuck open.
- c The spool valve is leaking back to the tank.
- d The cylinder gland seal is damaged.

33 Why is it important to wear nitrile gloves when working on a hydraulic system?

- a To prevent scalding.
- b To prevent gangrene.
- c To prevent dermatitis.
- d To prevent contamination.

34 What is the **minimum** tyre depth allowed on the roads when operating a machine over 3.5 ton Gross Vehicle Weight?

- a 1.0 mm.
- b 1.2 mm.
- c 1.6 mm.
- d 1.8 mm.

35 Before using any type of sealants, safety data sheets should be read under which one of the following health and safety regulations?

- a PUWER.
- b COSHH.
- c LOLER.
- d RIDDOR.

36 Who is responsible for reporting faulty components?

- a The operator.
- b The employer.
- c The technician.
- d The manufacturer.

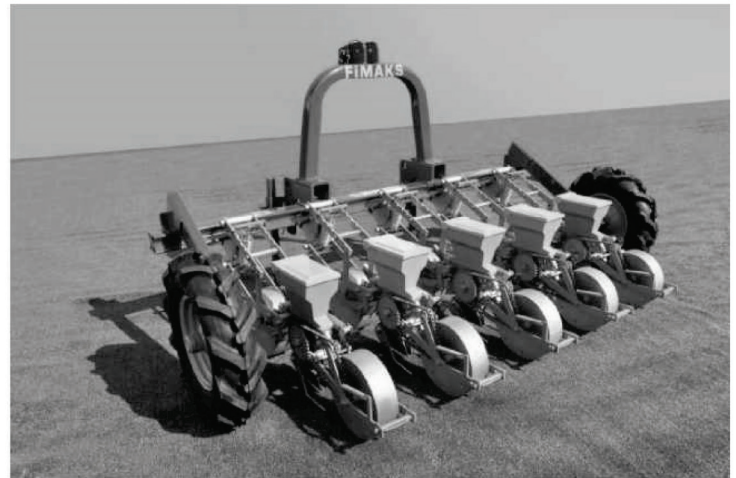


<https://carwarninglight.com//>

Figure 10

37 What does the warning symbol in Figure 10 represent?

- a High transmission oil level.
- b Low transmission oil temperature.
- c Low transmission oil level.
- d High transmission oil temperature.



<http://www.raviagric.com>

Figure 11

38 What is the piece of equipment shown in Figure 11?

- a A power harrow.
- b A stubble cultivator.
- c A precision seed drill.
- d A fertiliser spreader.

- 39 Before using a machine and driving it on the road, an operator **must** ensure that the tyre walls have no cracks to prevent
- a a blow out
 - b valve damage
 - c wheel wobble
 - d uneven wear.
- 40 A customer has reported that a petrol lawn mower will not start. Which one of the following is the **most** likely cause?
- a The air filter is missing.
 - b The plug gap is too large.
 - c The belt requires adjusting.
 - d The throttle lever needs adjusting.

To answer questions 41-46 you must refer to Scenario 1.

Scenario 1

A customer has reported that they have to keep jump-starting their tractor and has requested a technician to investigate the fault. They have also requested that the fuel filters are changed.

The following technical information has been supplied:

Alternator output:

Volts	13.8 - 14.8	@2100 rpm
Watts	560 - 770	@2100 rpm
Amps	95 - 99	@2100 rpm

Battery information:

Battery CCA	660 amps
Battery Reserve capacity @ 25 amps	100 mins
Battery voltage	12.5+ (80% charged)

- 41 What does the technician need to move the tractor into the workshop?
- a A hydrometer.
 - b Jump leads.
 - c An oil filter.
 - d Fuel filters.
- 42 Considering the customer's request, which **two** of the following items will need to be replaced on the tractor?
- 1 Primary fuel filter.
 - 2 Secondary fuel filter.
 - 3 Engine oil filter.
 - 4 Hydraulic oil filter.
- a 1 and 2
 - b 2 and 3
 - c 3 and 1
 - d 4 and 2
- 43 The technician carries out a voltage test across the battery with results of 11 v.
- What does this indicate?
- a The condition of the cells.
 - b The battery is fully charged.
 - c The electrolyte level is low.
 - d The battery requires charging.
- 44 The technician carries out a high rate discharge test and records the CCA at 700 amps.
- The reading suggests that the battery is
- a over heating
 - b in good condition
 - c discharged
 - d over charged.

- 45 After starting the engine, the technician has completed an alternator output check. The following was noted.

Alternator output @ 2100 rpm	12 volts
---------------------------------	----------

Statement 1

The alternator output is correct as per the technical information.

Statement 2

The alternator is charging the battery.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	False
b	False	True
c	False	False
d	True	True

- 46 Which one of the following is the **most** likely fault on the tractor?
- a A faulty starter.
 - b A faulty battery.
 - c A faulty ignition.
 - d A faulty alternator.

To answer questions 47-50 you must refer to Scenario 2.

Scenario 2

A customer has reported that their tractor cannot lift the plough and has asked a technician to investigate.

The workshop manager has supplied the following information:

Technical information: Pump output. 55 ltr/min @2200 rpm at normal operating temperature. Maximum pump output 100 bar.

- 47 What is the **first** action that the technician should take?
- a Check the hydraulic oil level.
 - b Check the front axle oil level.
 - c Check the gearbox oil level.
 - d Check the engine oil.

- 48 The technician completes a pressure and flow test on the hydraulic pump with the following results shown in Figure 12.

Pressure Bar	10	20	40	60	80	100	120
Flow Ltr/min	10	10	10	10	10	10	10

Figure 12

Statement 1

The results show that the oil flow through the pump is correct.

Statement 2

The results show that the fault is not in the hydraulic system.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	False
b	False	True
c	False	False
d	True	True

- 49 With reference to Figure 12, what is the **most** likely fault on the tractor?
- a The thermostat is stuck open.
 - b The hydraulic filter is blocked.
 - c The thermostat is stuck closed.
 - d The hydraulic spool is faulty.

- 50 Before handing the tractor back to the customer the technician should
- a ensure all filters and oil used is given to the customer
 - b carry out a complete function check of the tractor
 - c wait until all the time allocated for the job is used
 - d tell the stores to invoice the customer for parts used.

NOW GO BACK AND CHECK YOUR WORK

- IMPORTANT -

Are the details at the top of the answer sheet correct?

Have you filled in your answers in INK in the appropriate boxes on the answer sheet?