



Principal Learning

Engineering

OCR Level 3 Principal Learning **H811**

OCR Report to Centres June 2015

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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OCR Level 3 Principal Learning in Engineering H811

OCR REPORT TO CENTRES

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F556 Engineering business and the environment

General Comments:

This Unit was marked by the centre and moderated by OCR.
Centres are reminded that this report covers all of the centres that have submitted learners for this unit and must therefore decide which comments they should act upon.

All Centres submitted:
Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888.

All centres failed to submit a Controlled Assessment Summary Form WMS756

The following points need to be considered:

- Some centres made some use of contact with local industry.
- Learners presented work in a neat and tidy fashion. The use of a treasurer's tag is to be encouraged. A contents list with page numbers needed to be provided by learners.
- The specification states that all work must be annotated – in some cases nothing could be found that satisfied this condition.
- Some use was made of images. This and other similar types of media are to be encouraged.
- It is recommended that learners might find it useful to divide their folders into sections that follow the assessment criteria. Detailed information can then be found in the specification for each section. It also ensures that all assessment criteria are covered
- A number of folders followed the same type of presentation with a similar use of some material. In general terms, the centre should be empowering learners to take charge of their own learning and development.
- In some cases, learners need to be shown how to interpret more carefully the evidence requirements for each mark band and it was difficult to find a real progression across the mark bands.
- Presenters and markers are reminded that progression across the bands is characterised by: (i) increasing breadth and depth of understanding, (ii) increasing coherence, evaluation and analysis, and (iii) increasing independence and originality.

Comments on Individual Questions:

Assessment Criteria 1

The majority of learners were able to give an adequate description of the internal structure of a typical business and were able to identify different roles within the organisation. Some additional supporting evidence of possible career pathways through the business studied would have been useful.

There were some adequate responses in relation to internal and external factors affecting business operations of their chosen studies.

To gain higher marks a more detailed analysis of the risks associated with the business was needed.

Assessment Criteria 2

The majority of learners presented an adequate submission dealing with the roles of a 'Project Management' team and outlined the typical responsibilities of the individual members of the

team. The concept of good time management within the team was understood but more detail would have been useful.

To gain higher marks a more detailed explanation was needed in all areas of these criteria.

Assessment Criteria 3

An adequate description and evaluation was given by learners dealing with environmental issues linked to engineering businesses.

To gain higher marks a more detailed explanation and a deeper evaluation was needed in all areas of these criteria.

Assessment Criteria 4

Learners provided an adequate explanation of the possible effects of external environmental factors and how they are managed within a typical business organisation.

To gain higher marks a more detailed explanation was needed in all areas of these criteria.

Assessment Criteria 5

All learners undertook a simple chemical analysis using local environmental samples presenting their findings in a clear and logical format. Some learners made good use of graphs and images.

To gain higher marks a more detailed analysis and evaluation of results was needed.

F559 Instrumentation and control engineering

General Comments:

Section A - Most learners attempted ten questions.

Section B – All learners attempted four or more questions. When a learner answered more than four questions the four highest marks obtained were recorded.
Centres are reminded to encourage learners to attempt four questions only and spend their time on providing accurate and correct answers rather than wasting time on other questions for which they will get no reward.

In a number of cases learners attempted a question and then crossed out the response. Centres are urged to remind learners that this is not good practice because under some circumstances a marker can award marks for such questions but sometimes finds it difficult to interpret what the learner has written down.

In some cases the written response was difficult to decipher and learners should take care to write clearly and legibly.

Centres are reminded to encourage learners when answering questions that they limit their answers to the space provided on the answer sheet.

Comments on Individual Questions:

Section A

- 1(a)(b) This was a popular question attempted by all learners with a number of learners being awarded full marks for being familiar with block diagrams of a control system.
- 2 Generally well answered with a number of learners being awarded full marks. Most learners named correctly two output devices in a control system.
- 3 Generally well answered with a number of learners being awarded full marks. Most learners stated correctly the two input devices.
- 4 The concept of multiplexing was not widely known in detail. There were a few learners who failed to respond to this part of the question. In general learners knew that it involved putting more than one signal down the same route but after that the detail was hazy.
- 5 Generally well answered with a number of learners being awarded full marks. Most learners completed the sensor column correctly from the given list.
- 6 The formula for calculating the force exerted by the out-stroking piston was not well known.
- 7 Many learners showed a complete lack of understanding with regard to units of force. The formula for overall gain was relatively well known. There were some errors in the detail but in general learners gained the mark for this one particularly if they mentioned negative feedback.
- 8 A high proportion of learners completed the table incorrectly by not being able to name the two components shown as graphical symbols.

A few learners gained a mark for the 3/2 directional control valve but very few correctly identified the non-return valve.

- 9 The circuit diagram of an inverting operational amplifier was not well known.
- 10 Generally well answered with a number of learners being awarded full marks. Most learners named correctly two features of a burglar alarm access keypad.

Section B

- 1 The majority of learners answered this question.
- (a) A high proportion of learners stated the correct names for all three parts of this question.
 - (b) In general the formula for a positive feedback amplifier was correctly stated and used to determine the open loop gain. Other evidence showed that some learners had no idea of how to calculate the open loop gain.
- 2 A fairly popular question.
- (a) The explanations given for the terms listed ranged from learners having some understanding to others having little or no understanding. A number of learners gained at least one mark for their explanation of the terms listed.
 - (b)(i) Very few learners stated that it is a thermocouple that monitors a rapidly changing temperature. Too many thermistors used by those who had failed to notice 'rapidly changing' in the question.
 - (b)(ii) A few more learners than in part (i) stated that it is a Bourdon Gauge that monitors pressure in a corrosive fluid environment.
- 3 A fairly popular question.
- (a) A high proportion of learners stated correctly the two differences between a single acting pneumatic cylinder and a double acting pneumatic cylinder.
 - (b) The explanations given for the function of the parts of the pneumatic system ranged from learners having some understanding to others having little or no understanding. A number of learners gained at least one mark for each of their explanation of the three parts listed. In this question there was often confusion between pneumatics and hydraulics with reference to fluid flowing through the system. Learners must be advised that a question on pneumatics will be concerned with systems powered by compressed air.
 - (c) Not as many correct answers as anticipated to this question. Those who knew about practical pneumatics gained the marks, a lot of guesswork used by others.
- 4 Part (a) of this question was very popular.
- (a) A high proportion of learners gained full marks.
 - (b) Very few learners answered this question correctly. Most responses had no idea of how each type of control listed reacted to error changes. At least a few learners stated in vague terms that proportional mode produces a control action that is directly proportional to the error.
- 5 A fairly popular question.
- (a) A number of learners correctly stated that the NTC thermister has the property that when its temperature rises the resistance decreases and vice versa.
 - (b)(i) A high proportion of the learners completed the circuit diagram correctly so that the thermister would turn on the signal lamp under warm or hot conditions.
 - (b)(ii) This part of the question was badly answered. A number of learners had no idea how the circuit worked after making the point about the resistance of the thermister decreasing. It should have been obvious that the other resistor in the potential divider would be high

giving current a route through the base resistor into the transistor and so on enabling the signal lamp to light.

Operation of the circuit was not understood by the majority.

6 This was not a very popular question.

- (a) Most learners had no idea that a servomechanism is an automatic device that uses error-sensing negative feedback to correct the performance of a mechanism.
- (b) In general the practical applications chosen for this part of the question were close enough to gain at least one or two marks.
- (c) The description of any one of the control systems listed was not very well done. The most popular one was temperature control but with low level diagrams being produced. Learners had very little idea of how servo control or positional control is used.

7 A fairly popular question.

- (a) A high proportion of learners gave a reasonable explanation of why it is necessary to have alarm systems inside and outside a workshop building.
- (b) Most responses stated correctly three features that you would find on a system that is monitoring a factory production line. It was however, obvious that a few learners had no idea what a production line was or monitoring meant.
- (c) In general the industrial applications chosen for this part of the question were close enough to gain at least one of the two marks available. General mistake on this one was to use the names of monitoring devices from the alarm system, e.g. camera, rather than give an industrial application.
- (d) A lot of guesswork here, very few gave CCD, though a few gave a description of function of CCD.

8 A fairly popular question.

- (a) Most responses named four instruments that can be used in a virtual situation to test electronic circuits. A few learners named other items clearly showing they had no idea what the definition of an instrument is.
- (b)(i) A number of learners completed the diagram correctly by using one instrument to measure the resistance of a resistor. Other learners did not read the question carefully because they used more than one instrument and in some cases a power supply.
- (b)(ii) A number of learners completed the diagram correctly by using a power supply, an ammeter and a voltmeter. A few learners need to be reminded that a voltmeter must be connected across the resistor.

F561 Innovative design and enterprise

General Comments:

Centres are reminded that this report covers all of the centres that have submitted learners for this unit and must therefore decide which comments they should act upon.

This Unit was marked by the centre and then moderated by OCR.

All centres submitted the Internal Assessment Mark Sheet and the Centre Authentication Form correctly filled in.

The Controlled Assessment Summary Form was not provided by any centre.

The following points may need to be considered:

- Not all Centres provided a correctly completed Unit Recording Sheet. The centre number and candidate number panel were not filled in.
- The panel for page numbers and teacher comments had not been filled in. This causes a delay in the moderation process. It is important that evidence can be clearly tracked.
- Most learners presented work in a neat and tidy fashion but in some cases a treasury tag would have been better.
- The use of a contents list with page numbers should be encouraged. A number of learners had not provided page numbers on their work.
- Some use was made of images; this and other similar types of media are to be encouraged. Most learners made good use of ICT.
- Most of the folders observed followed a standard type of presentation with similar material being used. In general terms the centres should be empowering learners to take charge of their own learning and development.

Comments on Individual Questions:

Assessment Criteria 1

A number of learners were able to give a detailed description of different types of manufacturing processes and systems.

It should be clear that a manufacturing system includes one off, batch, mass production etc. and a manufacturing process can be casting, forming, cutting and joining. A number of learners provided little information about processes.

Where a learner was clear about systems and processes the advantages and disadvantage were clearly explained.

Assessment Criteria 2

A number of learners gave an adequate explanation of CAE, CAM and CNC. In a number of cases more detail was needed when dealing with the application of CAE, CAM and CNC within a manufacturing system.

Assessment Criteria 3

Most learners gave details of investigating and researching into assembly systems and techniques, quality control and quality assurance requirements and statistical process control. All research was very theoretical missing the opportunity to make the findings more exciting. Perhaps the use of images may have helped.

Assessment Criteria 4

Many learners did not produce a detailed production plan. The details that need to be taken into account include:

- materials, parts and components to be used including assembly systems
- processes to be used and statistical process control
- tools, equipment and machinery to be used
- the sequence of production, including critical production and quality control points
- production scheduling, including realistic deadlines
- how quality will be checked and inspected
- health and safety factors.

There was very little evidence that industrial visits had taken place or that videos had been shown or the use of visiting speakers had been employed.

Assessment Criteria 5

More detail was needed about software and how it was used to prepare a schedule for manufacture. A schedule for the production of an engineering product should include:

- all preparation, processing and assembly stages
- the sequencing and timing of stages
- critical production and quality control points
- production and quality control procedures
- allocation of tasks and responsibilities.

Some learners presented a Gantt chart.

F563 Mathematical techniques and applications

General Comments:

It was a pleasure to see so many well-presented and clearly argued solutions to the questions from learners who had clearly developed a very sound understanding of the principles and techniques required for this unit.

Section A - Most learners attempted all fifteen questions.

Section B – All learners attempted three or more questions. Centres are reminded to encourage learners to attempt three questions only and spend their time on providing accurate and correct answers rather than wasting time on other questions for which they will get no reward.

In a number of cases learners attempted a question and then crossed out the responses. Centres are urged to remind learners that this is not good practice because under some circumstances a marker can award marks for such questions but sometimes find it difficult to interpret what the learner has written down.

When attempting a question a few learners gave a final answer without showing any working. It is always in the best interest of the learner to show as much detail as possible because if the answer is incorrect nothing can be awarded but if information is provided of how the final answer was arrived at, marks can often be awarded for the methods employed.

Centres are reminded to encourage learners when answering questions that they limit their answers to the space provided on the answer sheet.

Section A Fifteen short answer questions

- 1 Generally well answered. A few learners did not complete the simplification but left it as $6x - 8x - 5$.
- 2 Generally well answered.
- 3 Generally well answered. A number of learners could not find a common denominator of 8 or 16.
- 4 Generally well answered. In a few cases after finding $18x - 30 = 8x - 14$ learners could not correctly arrive at $x = 1.6$.
- 5(a) Generally well answered with the correct answer of 60° .
- 5(b) Generally well answered with the correct answer of 2.0944 radians.
- 6 Generally well answered.
- 7 The majority of learners calculated the correct angle C as 60° but a high proportion of learners could not calculate correctly the length of side c.
- 8 A badly answered question. The majority of learners could not draw a labelled diagram of a right angled triangle that would lead them to the answer that $\sin x = 4/5$ or 0.8.
- 9 Generally well answered. In a few cases the rules of differentiation were not known.

- 10 A mixed response. Most learners differentiated $\sin x$ correctly but a multitude of incorrect answers were given for the differentiation of $1/x$.
- 11 A mixed response. Most learners stated the constant C but a high proportion of learners had no idea of the integral for $2 \sin 5x$.

12/13/14/15 Generally well answered.

Section B The learner had a choice of answering three questions from eight.

- 1 A fairly popular question.
- (a) Generally well answered with a majority of learners giving the correct response of 250.
 - (b) A high proportion of learners could not transpose the given equation for C.
 - (c) Generally well answered with a majority of learners stating that $u = \sqrt{v^2 - 2as}$.
 - (d) A high proportion of learners could not transpose the given equation for B.
- 2 A very popular question.
- (a) Generally well answered.
 - (b) A high proportion of learners calculated the correct value for Area A = 39.69 m².
 - (c) A high proportion of learners calculated the correct value for Area A = 48 m².
- 3 Not a popular question.
- (a) Learners did not appreciate that to find velocity you needed to use ds/dt and to find acceleration you needed to use ds^2/dt^2 .
 - (b) Very few learners started with ds/dr and subsequently did not state that the surface area is a minimum when ds/dr is equal to zero.
- 4 A fairly popular question.
- (a)(i) Generally well answered with the column being correctly completed.
 - (a)(ii) The grid was completed correctly by a high proportion of learners.
 - (a)(iii) The median number of minutes taken to carry out the workshop processes was generally quoted correctly.
 - (a)(iv) The method for determining the 60th percentile was not well known.
 - (b) A high proportion of learners calculated the mean correctly but very few learners calculated the standard deviation correctly.
- 5 A very popular question.
- (a)(i) A high proportion of learners calculated the value for u and a correctly.
 - (a)(ii) A high proportion of learners calculated the value for velocity v when $t = 6$ correctly as 40.
 - (b) A mixed response with some learners calculating correctly the value for x as -4 or $-2/3$ with others having little idea of how to use the quadratic formula equation.
- 6 A reasonably popular question.
- (a) Generally correctly answered using the sine rule.
 - (b) Generally well answered using the cosine rule.
 - (c) Generally well answered by the majority of learners.
- 7 Not a popular question.
- (a) Most learners integrated correctly $\cos 2x$ but only a very few managed to deal correctly with $1/x^2$ and \sqrt{x} .
 - (b) Generally well answered calculating the distance travelled by the vehicle as 95 metres.
 - (c) Very few learners calculated the work done correctly even being given the clue of the work done integral.

- 8 A popular question.
- (a) The meaning of the term 'dependent event' was not well known.
 - (b) It was fairly obvious that some learners had no idea of what they were doing but others gained marks for stating $120/300$, $119/299$ and $118/298$ but then could not use this information to determine the probability that the three screws taken from the container would all be steel.
 - (c) Most learners gained some marks for completing the table.

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