RECOGNISING ACHIEVEMENT

Principal Learning

Engineering

OCR Level 3 Principal Learning **H811**

OCR Report to Centres

January 2012

H811/R/12J

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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

Overview

This is the fourth year of assessment, with this being the sixth award for the Principal Learning units within the Diploma in Engineering.

The opportunities for presenters to attend INSET, to use the excellent support materials provided and make their views known on the delivery and assessment of units has helped the development of many of the units within the scheme. All presenters are encouraged to attend one of a number of opportunities that are available for training.

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 (iii) increasing independence and originality.

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.

There is evidence that some centres are becoming systematic in their approach to this diploma. With this systematic approach in mind centres should consider the learners' complete learning experience when designing learning programmes. This is particularly important in relation to learners studying part time alongside real work commitments where they may bring with them a wealth of experience that should be utilised to maximum effect by presenters.

When a disc is being submitted more attention needs to be paid to the labelling of files. In future each learners file must be named according to the following instructions:

Centre number_Candidate number_Unit number_Series.

F556 Engineering Business and the Environment

This unit was marked by centres and moderated by OCR.

The following points need to be considered:

- Centres need to make more use of contacts with local industry.
- All learners should present a contents list with page numbers and then make sure that the numbers appear on the URS888 and the work.
- 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 sections are covered. The folder should be securely fastened together.
- 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.

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 needed more detail from some learners.

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

Assessment Criteria 5

Learners undertook a simple chemical analysis using local environmental samples presenting their findings in a clear and logical format. Good use was made of bar charts but in some cases graphs of results would have been useful. In most cases good use was made of images. To gain higher marks a more detailed analysis and evaluation of results was needed.

F557 Application of Computer Aided Designing

This unit was marked by centres and moderated by OCR.

The following points need to be considered:

- All learners should present a contents list with page numbers and then make sure that the numbers appear on the URS888 and the work.
- 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 sections are covered. The folder should be securely fastened together.
- It is anticipated that learners will work on the production of a range of 2D and 3D CAD models of design ideas. It is possible that work undertaken at Level 2 could be further enhanced using the learner's own brief and specification from previous units.
- If the Level 2 work is not followed through then learners will need to produce a design brief and specification even though there are no marks for this.
- Models could be produced using reverse engineering techniques from existing products incorporating standard components. This approach could enhance the presentation of the technical work required for the product study in Unit F558: Selection and application of engineering materials.
- It is recommended that one model should be the result of concurrent engineering methods.
- The results of testing could be recorded in short reports with screen shot animation or video sequences. Evidence could also include the use of digital photography taken in real time as activities occur.
- In general terms Assessment Objectives 1.1, 2.1 and 3.1 seemed to have had sufficient time devoted to them but Assessment Objectives 4.1, 5.1 and 6.6 need more attention.

Assessment Criteria 1

All learners made appropriate and effective use of 2D and 3D software in designing and modelling engineering products.

Learners should be encouraged to use components of existing products as a basis for CAD modelling, scanning and reverse engineering – consumer products, engineering components, jewellery, historical artefacts.

Learners should incorporate standard components in assemblies of parts – fastenings, nuts, bolts, screws, gears, pulleys, racks; electrical and pneumatic components.

Assessment Criteria 2

The majority of learners produced detailed and accurate drawings to specified British and International standards.

Assessment Criteria 3

The majority of learners produced realistic and high quality presentation drawings which adequately communicated design intentions.

However, in some cases more detail was needed when learners produced, modified and stored drawings of the product. Use was made of colour, rendered, textured, exploded, sectioned and annotated views. Some learners could have created temporary cross sections or translucency to view interior details.

It is recommended that more views of parts enhanced by photorealistic material rendering with the addition of background images and additional graphics relevant to the designed product should be included.

Assessment Criteria 4

In a number of cases more detail and attention needed to be paid to the selection of appropriate materials and processes when designing for manufacture. Many learners did not provide an in-depth response to the testing and modification of design ideas.

Learners could have given more detail of how they manufactured a prototype in foam or wax to evaluate ergonomics. Not much evidence was provided for simulation motion in parts and assemblies and how the use animation was carried out to explain the workings of mechanisms. Much more evidence could have been provided by the use of screen shots, digital photographs, animations and video sequences.

Assessment Criteria 5

To gain higher marks it was necessary for learners to give more detail regarding the research that was carried out to identify and evaluate the application of CAD/CAM within combined design/manufacturing systems. Visiting speakers and industrial visits are to be encouraged.

Assessment Criteria 6

A high proportion of learners did not carry out detailed research to identify and evaluate a wide range of applications of concurrent engineering within design and manufacturing systems.

F559 Instrumentation and Control Engineering

Section A

1 Generally well answered with a number of learners being awarded full marks. Those who did not gain full marks had failed to include arrows to show the direction of flow. In a few cases the learner had shown more than was required by including a feedback loop.

2 Generally well answered with a number of learners gaining full marks by being able to name two types of system that use feedback control.

3 Generally well answered with most learners being able to state the correct formula for overall gain in a system using negative feedback.

4 This question caused some problems. The majority of learners gave vague answers.

5 Generally well answered. Those learners who had used a logic probe and were familiar with its function gained the marks. Those who had not used a logic probe generally gained a mark for knowing that it is used for analysis of a circuit but did not mention that it measures the logic state in terms of high/low or 1/0 for the second mark.

6 Generally well answered but there was confusion in some cases between pneumatic and hydraulic applications. Learners should be advised to only consider those applications such as door opening and removal of items from a conveyor which are definitely pneumatic. Application involving the raising of heavy loads will generally be hydraulic.

7 Generally well answered by the majority of learners correctly naming two types of display units.

8 This question was not well answered. The majority of learners could not name two of the main units used in a Programming Logic Controller (PLC). In a few cases individual electronic components were named rather than a unit within the controller.

9 Generally well answered by the majority of learners correctly naming two semiconductor materials.

Section B

Four questions from eight to be answered.

1 A fairly popular question.

(a) Temperature operated circuits were generally well known but in a few cases learners should be more precise in their description exactly where the circuit would be used in their chosen application. eg. ‘opening a window for ventilation in a greenhouse’; rather than just giving ‘greenhouse’ as the answer.

(b) Both components were generally identified correctly, a few instances were seen where a descriptive term such as ‘thermal resistor’ was used rather than the correct name for the component.

(c) The principle of operation of the temperature operated circuit was not well known. Learners should be advised that in a question of this nature they should think in terms of a system and describe each part of the system in turn. In this case the first part should have been the resistance of the thermistor decreasing as it gets hot, resulting in the voltage output of the potential divider rising to switch on the transistor.

2 The majority of learners answered this question, with most gaining marks in all three parts.

(a) Generally well answered with most learners being able to state two practical applications that use an analogue to digital (A/D) converter.

(b) Generally well answered with most learners being able to name the two components 'A' and 'B' but with a few learners not being able to name the encoder.

(c) The principle of operation of the parallel analogue to digital (A/D) converter was generally well known. A few learners could have obtained higher marks by considering the A/D converter as a system, starting with the input and ending with the signal being an output in binary format.

3 This was not a popular question. No responses were found.

4 A fairly popular question.

(a) Generally well answered with the correct graphical symbol for a double acting cylinder. In many cases the quality of the drawing was not very good. Learners should take more care and note that the piston on the graphical symbol should be represented by a double line and each of the air lines by a single line.

(b) Those learners who answered the question generally gave at least two correct applications for the double acting pneumatic cylinder. In some cases it is important that examples given in a question of this type should be precise rather than naming a process or machine which includes a number of moving parts.

(c) The use of a 5-port valve to operate two double acting pneumatic cylinders was not well known. The connections should have included two T-connectors to divide the main air supply from the 5-port valve to each end of the cylinders; this was not carried out in most cases. There was also some confusion on which ports of the 5-port valve provided air to the cylinders.

5 A fairly popular question.

(a) The term 'feedback control' was generally understood by a number of learners.

(b) Most learners who had chosen this question gained at least one mark for stating a correct example of feedback in a control system.

(c) There were mixed responses to the calculation of open loop gain. In most cases the correct formula was used and values were accurately substituted. Rearrangement of the formula caused problems for some learners and in some cases the correct result was arrived at and the learner then carried out further calculation ending up with an incorrect answer. A methodical approach should be used with calculations, showing each stage; if this is done then intermediate marks can be awarded.

6 A fairly popular question.

(a) The term 'input' was generally understood by a number of learners.

(b) Generally well answered with the majority of learners naming correctly an input and output device in a control system.

(c) There were mixed responses to this question. A block diagram was required to illustrate a closed loop control system in one of the given applications; in some cases the system block diagram was of an open loop control system, in others either a generic diagram was given or it was not clear which of the chosen applications had been used. Written descriptions were in some cases very brief and failed to refer to each part of the system.

7 This was not a popular question. No responses were found.

8 A popular question.

(a) The naming and purpose of a simulation software package was well known.

(b) The majority of learners gave two correct benefits of using simulated software packages.

(c) There were mixed responses to this question. A description was needed of how a package was used to model and test circuits. In a number of cases marks were lost because the description referred to the operation of an electronic circuit or component rather than to how the software had been used to model and test the circuit.

F563 Mathematical Techniques and Applications

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.

Presenters must urge learners to read the questions very carefully noting in particular when an answer is needed to two decimal places or to the nearest degree.

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

Section A

1 Generally well answered but in a few cases learners removed the bracket but stated the incorrect answer of -32.

2 A mixed response. The answer of (x + 3)(x - 3) was not well known.

3 A mixed response. In a few cases after finding (2x +8 - 5x - 15)/10 it was disappointing to find learners could not correctly state the final answer as (-3x - 7)/10.

4 Generally well answered.

5 A mixed response. A high proportion of learners stated the incorrect formula for the circumference of a circle.

6 Generally well answered. In a few cases the answer was not corrected to the nearest degree.

7 A mixed response. In a few cases a cosine waveform was not sketched on the axis.

8 Generally well answered.

9 A mixed response. In a few cases the rules of differentiation were not known.

10 Not well answered. Most learners struggled to differentiate this equation.

11 & 12 Not well answered. In most cases the rules of integration were not known.

13,14 & 15 Generally well answered. A high proportion of learners answered these questions correctly.

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

1 In most cases, for all parts, learners achieved high marks. Part (c) proved to be the most difficult.

2 **(a)** Solving a quadratic equation by using the formula proved to be difficult for a number of learners.

(b) This part was poorly answered. Many learners could not substitute the correct numbers into the equation before attempting a solution.

3 Not a very popular question. Presenters and learners are urged to re-read the specification that deals with trigonometry and in particular the exemplification column that provides an example of this type of question.

4 A mixed response, but the strong learners achieved high marks.

5 No learner attempted this question.

6 No learner attempted this question.

7 A very popular question.

(a) **(i)(ii)** High marks being obtained by a majority of learners.

(b) **(i)(ii)** High marks being obtained by a majority of learners.

(c) Some confusion about determining the probability that both the selected items would be relays.

8 Not a very popular question.

The shape of a normal distribution curve was not well known. Learners found difficulty in calculating the variance and standard deviation for this sample.

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