GCE

Electronics

Advanced GCE **A2 H465**

Advanced Subsidiary GCE **AS H065**

OCR Report to Centres

June 2012

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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 REPORT TO CENTRES

F611 Simple Systems

There were very few incidences of candidates not attempting questions, given the wide coverage of the specification in the paper this suggests that candidates were broadly familiar with all parts of the specification. There were some excellent answers on many scripts with candidates showing a good understanding of electronics.

However, it useful for future candidates and their teachers to be aware of some of the more common mistakes so that they can prepare for exams and overcome some of the common misconceptions in the subject. There were some noticeable issues which limited the marks of a number of candidates.

When talking about diodes (including LEDs and zener diodes) a number of candidates confused use of the terms forward biased and reverse biased – often using them the wrong way around or inconsistently.

Some weaker candidates had problems giving the correct powers of ten for pico and sometimes micro.

There were some poor circuit symbols for some common components (eg LDR, MOSFET) – candidates cannot be awarded marks for their circuits were the symbols are wrong, ambiguous or unrecognisable.

Some candidates incorrectly simplified Boolean algebra where no manipulation was necessary, so lost marks. Unless candidates are completely secure with their Boolean algebra it is unwise to try to manipulate an equation unless asked to do so. It is not possible to give a mark where more than one possible answer has been given.

Some candidates used too few significant figures in calculations and so could not get to the required answer. This is a particular problem where candidates only used one s.f. in intermediate calculations so rounding errors compounded quickly. There was also some incorrect rounding (eg 3586 rounded to 3500). When a question asks a candidate to 'show that' a variable 'is about', then the variable should be given to at least one more significant figure than the value in the question.

Candidates should be aware that multiple answers do not get marks even if one answer is correct.

Many candidates do not understand that a speaker only makes a noise when driven with a wave and mistakenly think that a noise is emitted when a constant pd is applied to a speaker.

Algebraic manipulation proved to be a problem for some weaker candidates who could not get the correct numerical answer to a question because they could not accurately rearrange a formula. Simple algebraic manipulation is an important skill.

Questions

1(a) Candidates have become much better at answering this kind of question over the lifetime of the specification and most now realise that the arrows in a block diagram show the flow of information. There are still a significant minority of candidates who mistakenly write "current" or confuse a block diagram with a flow diagram.

(b) Most candidates knew about the need for resistors for LEDs. Some candidates gave rather weak and imprecise answers often failing to mention overheating in response to too much current.

Most candidates found calculating the resistor value straightforward but there are a large number of candidates (~40%) who fail to understand that they first need to calculate the voltage across the resistor before applying Ohms law. This has been a significant issue over the lifetime of the specification and indicates that some candidates may not be grasping how voltages in series circuits work (Kirchhoff's voltage law).

The graph of the diode characteristics was a good discriminator with a range of answers; some candidates lost marks because their lines were nowhere steep enough in the conduction zone.

(c) There were elements of recall and interpretation here and a range of answers reflecting this.

2 Parts **(a)**-**(c)** where not challenging for almost all candidates who got full marks. There were a range of techniques for part **(c)** which were all valid and produced the same result.

Part **(d)** was more challenging, most candidates got the correct answer but there were a sizeable minority who could not get an answer and got tied up trying to rearrange some equation they had remembered for the potential divider.

(e) There were some good logical explanations starting from the left hand, input side of the diagram referring to the voltages at each input of the op-amp an the working through to the output voltage of the op-amp and then the reverse biased state of the LED.

(f) There were many full mark answers but a significant number of candidates who completed a circuit that would turn the LED on when it was light. There were also a number who did not use an LDR as a sensor with a number of thermistors and some unrecognisable symbols used.

3 This question was completed well by almost all with the main source of errors being the Boolean expression for the output of the NOR gate.

4 More than half the candidates could answer this question correctly suggesting that candidates are generally familiar with using the rules of Boolean algebra.

5(a) About half of the candidates obtained full marks for their circuit. There were a high number of poor MOSFET symbols which did not clearly show that the drain and source were correct. There were also some extremely poor speaker symbols. Most candidates realised that the speaker and MOSFET needed to be in series with the power supply and the gate needed to go to the output of the Schmitt NOT gate.

Parts **(b)** and **(c)** were straightforward for the vast majority of candidates.

Part **(d) (i)**-**(iii)** gave full marks for the majority of candidates but a number answered 5V/div for **(i)** and a significant number gave 100□s/div for (ii) indicating an issue with recognising the period as being the time for a full wave.

Part **(d)(iv)** was a more difficult question which was completed well by about a quarter of the candidates, a reasonable number of candidates gained some marks by showing the capacitor charging and discharging with the wrong phase but the majority could not produce anything worthy of marks.

In part **(e)** most candidates could say something useful about the operation of the switch and NOT gate but very few wrote about the effect on the charging and discharging of the capacitor. There was much evidence that many candidates mistakenly thought that a speaker made a noise when there was a continuous current through it in a similar way to a buzzer.

6 (a) Most candidates realised that the resistor needed to be large and calculated values for R and C from the equation given in the data sheet. There were a few candidates who had problems with rearranging the formula.

Part **(b)** caused problems for many candidates who did not clearly describe the basic behaviour of the monostable.
Candidates had few problems with the operation of the switch in part (c).
Whilst most candidates could correctly answer part (d) a significant number failed to calculate the voltage across the 220□ resistor and so obtained the wrong answer.
The majority of candidates realised that components needed to have a power rating at or above the calculated value so gave the correct answer for (e) with only a few wrongly choosing the closest value to the calculated power.

7 Candidates had few problems writing an expression for R in part **(a)**. A few candidates got into difficulty trying to write a simplified expression which was not necessary. There were many good answers for **(b)** with some candidates simplifying their expression in **(a)** to allow them to draw a smaller circuit in **(b)**. A few candidates could complete **(a)** correctly but not draw a working circuit for **(b)**.

8 The question was on the Exclusive OR gate was attempted by all candidates with most candidates receiving high marks indicating that candidates had sufficient time to complete the paper. There were few problems with parts **(a)** and **(b)**. Part **(c)** was generally well answered, a few candidates failed to correctly analyse the switch inputs and so did not obtain full marks for **(c)**.

F612 Signal Processors

The average mark for this paper went up again, for the second year running. Having said that, no candidate earned full marks (although several got very close to it) and some candidates managed to earn only a handful of marks. With a couple of exceptions, detailed below, candidates had a go at all of the questions and there was no evidence that any of them ran out of time.

It is important that Centres realise that in an exam with no choice of questions, each question can be set in a context anywhere in the module specification. To avoid a topic because it is a hard one can disadvantage candidates. It was evident from the responses to this paper that many candidates were relatively unfamiliar with terms such as *open-loop gain*, *input impedance*, *active-low input,* as well as the operation of summing amplifiers and frequency dividers.

Many of the calculations required candidates to not only select the correct formula from the data sheet, but also to able to transpose them before use. A large number of weak candidates cannot manipulate algebra reliably – and consequently lost marks as they worked their way through the paper.

Questions

Q1 This question was about configuring an op-amp as a voltage follower. Less than half the candidates could draw the complete transfer characteristic correctly – many omitted to show the saturation at +13 V and -13 V. However, only the strongest candidates could identify the voltage follower as a power amp. As expected, many candidates struggled to explain the meaning of *open-loop gain*, with only a small minority able to do this. Too many candidates assume that *A* represented current. Many weak candidates could not state the output voltage of a voltage follower given its input voltage, but nevertheless obtained the marks for calculating the current and power of the loudspeaker.

Q2 This year there were fewer instances of candidates attempting to use non-standard flowchart symbols or syntax. Nevertheless, only a third of candidates earned full marks for filling in the flowchart of part (a), often because they were unable to convert the eight-bit word 0010 0000 into hexadecimal. In part (b), many weak candidates assumed the output display went in the order 1, 2 and 3, and wrote down (usually) the appropriate binary word to achieve this – earning only half the marks. On the other hand, strong candidates translated the hexadecimal words from the flowchart into binary and then deduced symbol shown on the display – for full marks. The last part of the question required candidates to write a flowchart. It discriminated very well, with strong candidates earning full marks.

Q3 The majority of candidates earned full marks for completing the block diagram of an amplifier system. There was some confusion about where to place the power amplifier - too many candidates did not put it immediately in front of the loudspeaker. Similarly, too many candidates wanted to put the volume control after the power amplifier. Weak candidates struggled to draw the correct symbol for an electret microphone (all the symbols are listed in the specification) and often did not know where to place the capacitor. Although most candidates correctly chose an input impedance for the amplifier which was much greater than the output impedance of the microphone, only about half of them could give a respectable justification for their choice. However, only a small minority of candidates failed to get full marks for the transfer characteristic of the treble cut filter, often because their line did not drop at 45° above the break frequency. The last part of the question required candidates to design the filter. Strong candidates had no difficulty in earning all of the marks and weak candidates often earned none – sometimes because they didn't have a go at all. Too many candidates lost marks because they ignored the question and set the input resistor to some value other than 30 kΩ.

Q4 This question about a sequence generator proved to be straightforward for most candidates, but weak candidates struggled to earn the marks. One in ten candidates did not even attempt to add the logic gate to reset the counter, and too many seemed to assume that D was the least significant bit for BCD. Although most candidates could select an appropriate value for the resistor of the relaxation oscillator, only half were able to select the correct formula from the data sheet, transpose it and deal with the various powers of ten to get a correct value for the capacitor. A surprising number of candidates were unable to fill in the table with the correct sequence of counter outputs. Nearly all candidates who wrote down the correct expression for Z in terms of C, B and A were also able to draw a correct logic circuit for the system. Q5 This question was about the behaviour of a NAND gate bistable, a topic which many candidates found challenging. Although many could adequately describe the behaviour of a NAND gate (some only defined the output when both inputs were high, not declaring the output state from other combinations of input signal), many had difficulty in defining the terms *active-low*, *set* and *reset*. Similarly, only the strongest candidates could confidently explain the operation of the bistable in terms of the behaviour of individual gates. Although the vast majority of candidates felt able to complete the timing diagram for the bistable, only strong candidates managed to earn all of the marks. Too many weak candidates assumed that a pulse at either input changed the state of the output.

Q6 The first part of this question required candidates to connect a flip-flop to make a binary counter. Many candidates wrongly connected the S and R terminals to the nearest supply rail instead of the 0 V rail, or ignored them altogether. Only the strongest candidates were able to calculate the frequency of the oscillator, suggesting that many weak candidates are unfamiliar with the operation of a frequency divider. Similarly, although strong candidates stated that crystal oscillators were better because their frequency remained more constant with time, many weak candidates struggled to express their meaning, using inappropriate terms such as *accurate* or *precise*. The sentence completion exercise of part (b) did not discriminate well, mainly because many strong candidates did not realise that the output of a counter displaying numbers on an LED can output ten different words. However, it was good to find that the objective nature of part (c) allowed many weak candidates to show their understanding of the behaviour of a master-slave arrangement of latches to make a flip-flop.

Q7 This short question tested the ability of candidates to recognise a summing amplifier and perform calculations for it. Nearly all candidates were able to correctly identify the volume control. Weak candidates struggled to earn any marks at all for part (b), either ignoring the summing amplifier formula or being unable to use it. Strong candidates had no such difficulties. Only the weakest candidates were unable to design an inverting amplifier with a gain of 5.

Q8 The objective nature of part (a) allowed many weak candidates to show their understanding of the difference between hardware and software for microcontrollers. Too many assumed that the hardware was the plastic covering of the microcontroller. Part (b) Many candidates were able to give a good reason why microcontrollers are widely used, however some were under the impression that this is because they can be *re*programmed, whereas most microcontrollers are programmed only once in their lifetime.

F613 Build and Investigate Electronic Circuits

This year, moderators have commented on the quality and accuracy of the centres marking and that very few centres fell outside the allowed tolerance for this module. As always, the annotation of scripts is both a useful tool to aid a centre in the marking of scripts but also as a guide for moderators to identify any possible misconceptions in the awarding of marks. The annotation only needs to consist of brief identifying marks highlighting where a particular criterion has been achieved.

It was also interesting to note that some centres had made use of the OCR Repository for the uploading of requested samples of coursework. This does present some advantages, the least of which is that coursework samples no longer need to be posted. Moderators also reported that this year saw a significant number of clerical errors, usually due to the incorrect addition of marks. Centres are encouraged to have all marks, and the transfer of marks to the MS1 form, checked by an independent person. Also, where two or more members of staff are responsible for the marking of scripts, an internal moderation process must be carried out to ensure uniformity of marking.

It was noted that for the digital and analogue parts, some centres submitted circuits which contained two connected subsystems to be investigated, for example, a relaxation oscillator clocking a four bit counter which resets on a particular number, or a voltage amplifier feeding an active filter. This, of course, is not disallowed but does increase the amount of work to be done by candidates and the possibility of not achieving all elements of the criteria. The description of the circuit, the predictions, and the test plan are all more involved. The circuit has more elements to build, and the results taken are likely to require a greater amount of presentation.
For criterion 1a, it must be stressed that the possible use of the circuit must be relevant to the circuit and must be specific. For example, if a relaxation oscillator is considered, a stated possible use 'as a timing device' would not score a mark, but 'as the clock input to a counter' would score a mark.

Test plans, criterion 1b, can still cause trouble. Some candidates were still presenting the test plan as how they actually did the testing, rather than an actual plan of how they proposed to test the subsystem. Test plans are important and should focus the candidate on considering what the output/s should be for given input/s and how this can be tested. Useful analysis can be carried out to ascertain whether subsystem behaviour is as expected. To gain high marks for this, candidates must be very specific when describing the use of test equipment.
Analysis of results (criterion 3c) is a higher level skill and does pose some problems for some candidates. It is difficult to imagine a subsystem in which some numerical analysis cannot be performed. Thus, to gain high marks for this criterion, numerical analysis should normally be evident.

Diagrams, criterion 4a, must be useful and complement the written communication. A diagram of the pin-out of a particular IC would not be considered to complement the written communication. In addition to a correct circuit diagram, there must be other useful diagrams included in the report to gain high marks for this criterion. These could be diagrams of predicted outputs, transfer characteristics of a particular device, etc.

F614 Electronic Control Systems

Most candidates showed an understanding of topics across the whole range of the unit. There were a wide range of marks obtained.

In order to help candidates and their teachers it is useful to highlight some common issues which limited the marks of a number of candidates:

- Some candidates do not use the idea that potential differences add up around a series circuit (Kirchoff's voltage law) and so cannot get the correct answer in a number of calculations.
- Some written explanations are weak. The best explanations are structured and methodical eg starting with the input and working through the circuit to the output mentioning voltages and currents on the way.
- Questions requiring candidates to use graphs to show the behavior of circuits discriminate well between high and low achieving candidates.

Details by question

1 Most candidates had few problems calculating the current in **(a)**, the few who had a problem here showed difficulty calculating and dealing with negative numbers to the voltage across the 330Ω resistor or just chose some 15V or 30V from the power supplies. There were few problems adding the capacitor in **(b)**. Many candidates did not say that voltage followers amplified current or were used to interface a high impedance output to a low impedance input in **(c)**. The graph showing the signal at the output of the circuit was completed well by about a quarter of the candidates, many others failed to include the 2V offset and about half the answers failed to show a wave of the same shape and amplitude as the input wave.

2 **(a)** and **(b)** were unproblematic for almost all candidates. The explanation of why the heater was on in **(c)** was generally well completed but some candidates would have benefitted from a more structured approach to their answers. Most candidates explained in (d)(i) that this was an on/off system that hunted. The explanations in **(d)(i)** often lacked any reference to the thermistor continuing to get hotter for some time after the heater is turned off/continuing to get cooler for some time after the heater was turned on. The graph in **(d)(ii)** was usually well completed with a few candidates failing to show the hunting around 7V or not showing the correct phase for the voltage at Y.

3 The calculation in **(a)** was usually correct but many candidates failed to get the correct answer in **(b)**, often using the wrong number of bits (frequently giving 31 as the answer). There were some common errors in the question asking for the voltages in part **(c)**: some candidates used 1and 0 instead of 5 and 0 (losing 1 mark if all else was correct), many candidates failed to understand that the control signal were active low, a number of candidates failed to get the correct binary for the address lines. The sequence in **(d)** produced some good answers, candidates who failed to obtain full marks often failed to say that the write line should be pulsed low or brought low and then brought high again. Some candidates failed to get the sequence of signals in the correct order and some had problems with the binary to get the correct data and address signals. The diagram in **(e)** often showed a good working circuit, there were several different good solutions drawn. However, some candidates did not know what to do with A_5 and a significant did not get the logic correct to allow /CE to operate.

4 The descriptions of the address bus and progam counter both discriminated well between candidates. The program counter proved more challenging and there was a lack of clarity in many answers and signs of confusion with the stack and/or stack pointer. The diagram in **(c)** proved easy for the majority of candidates. Many candidates failed to say that the reset pin was used to make the microcontroller go back to restart the program from the beginning.

5 The explanation in **(a)** proved challenging for many candidates with only a small minority obtaining full marks. The best answers gave values for the voltages in the circuit, a significant number of answers wrongly analyzed the circuit as being an on/off system and suggested that the output B saturated high and low. Most candidates showed the correct calculation for **(b)** but a significant number of candidates wrongly divided 15 V by 3.6 kΩ. In part **(c)** a number of candidates failed to calculate the voltage across the MOSFET correctly and erroneously used 14 V. The question about the MOSFET in **(d)** was just looking for candidates to point out that the current output of the op-amp was limited and the MOSFET could conduct a large current but most candidates did not realize this and were confused by the context of the circuit. The last part of 5 was a testing question, to get full marks in part **(e)** candidates needed to refer to the saturation voltage of the op-amp and the threshold voltage of the MOSFET.

6 There were some excellent answers to the microcontroller question with many candidates showing good familiarity with coding in assembly. Most answers to part **(a)** were very good but some candidates limited their marks by not referring their answers to what happened to the output device (door opener and LEDs) and which input devices it was responding to (often just paraphrasing the datasheet). Part **(b)** was well answered, almost all candidates said that green LED lit for 10s the shift function was slightly more challenging. Part **(c)** was perfectly answered by the majority of candidates showing good familiarity with polling, the most common mistakes were using the wrong jump, incorrect label placement or using the SUB function rather than AND when testing the input. The final part **(d)** was intended to be testing and proved challenging for most candidates.

7 Part **(b)** most candidates could calculate the resistance from the slope of the line, but some candidates tried to use the 2.5 V in the calculation. In part **(c)** candidates who spotted that this was essentially a potential divider problem solved this problem. Most candidates realised that reducing the control voltage in part **(d)** would increase the resistance of the MOSFET and so increase the amplitude of the output, some worked out that the current in the MOSFET would change but did not follow through to the correct change at the output. The final parts of the question were intended to be challenging to differentiate between the higher grade candidates. In part **(e)** many candidates realised that the sloping part of the graph was important but not all explained that this was resistive behavior or what happened to larger signal. In part **(f)** many candidates said that the [amplitude of the] output signal increased up to a certain value of input and then got stuck. There were some excellent answers from high achieving candidates with calculations of amplitudes of signals and clear explanations of the behavior of the circuit in the non-linear region showing good understanding of MOSFETs.

F615 Communication Systems

With few exceptions, all candidates had a go at all of the questions and there was no evidence that any of them ran out of time.

Weak candidates often fail to earn marks on the free-response questions by their imprecise use of vocabulary (such as confusing *amplitude* with *voltage, interference* with *noise, resistance* with *reactance ...)* Centres need to bear in mind that a proportion of the marks of this paper are synoptic, revisiting aspects of the AS course. It is therefore important to emphasise these aspects each time they arise on the A2 course.

Questions

Q1 This question was about video displays. Too many candidates produced low level answers to many of its parts. Most candidates had no difficulty in showing why 42 levels of intensity required six bits of information. However, only a minority could say enough about start and stop bits to earn full marks, such as their placing in the transmitted word , their state or their function. As in previous exams, many candidates think incorrectly that a stop bit tells the receiver when a word has finished. It was disappointing to find that even the most able candidates were unlikely to correctly negotiate the bandwidth calculation, with many forgetting that each word contained six bits. Although most candidates could explain the function of the line and frame sync signals, only a minority were able to describe the raster scan of the LEDs. Similarly, although most candidates knew that a full colour display required separate streams of information for red, green and blue colours, few mentioned that each stream needed its own cable in order to provide independent control of the light intensity of each primary colour.

Q2 Many candidates earned high marks for this question about amplitude modulation. Although the majority were able to calculate the frequency of the modulating signal from the oscilloscope trace, only a minority were able to state its amplitude. It was good to find that many candidates could recall and apply the relationship between the bandwidth of an amplitude modulated signal and the frequency of the modulating signal. Very few candidates of all abilities were unable to correctly draw the frequency spectrum, but only the strongest were able to draw a diode demodulator and justify its values with calculations. Weak candidates lost marks by placing components in the wrong place, forgetting to label the 0 V rail, using the wrong rule to justify the component values, being unable to transpose the correct rule or making mistakes in converting powers of ten to their prefixes.

Q3 This question about frequency modulation provided more discrimination than the previous two, with strong candidates earning full marks but weak candidates earning very few. Many weak candidates lost a mark by stating that the frequency of the FM carrier depended on the *amplitude* of the AF signal, instead of its *voltage*. Only half of the candidates were able to identify both correct statements about frequency modulation, with many assuming that it didn't pick up noise in transmission (it does, but the noise can usually be removed at the receiver). The last part of the question was the first of the stretch-and-challenge questions. It was therefore good to find that most strong candidates could remember how to complete a block diagram for an FM demodulator and explain the function of each block.

Q4 Only a minority of candidates were able to draw a completely correct block diagram for a PWM transmission system, few earned no marks at all, with many losing a mark by wanting to replace the Schmitt trigger with an amplifier. Many candidates had difficulty in calculating the time-average of the voltage-time graph, suggesting a weakness in this skill. Although some candidates knew that the signal needed to be sampled at least twice in each cycle for successful demodulation, too few showed how they worked out the sampling frequency from the voltage-time graph.

Q5 The first part of this question was synoptic. Only strong candidates were able to correctly draw all three op-amp circuits from the AS course. Part **(b)** also provided excellent discrimination, with strong candidates earning full marks. The objective nature of part **(c)** allowed even the weakest candidate to earn a mark, whereas even the strongest candidate lost one by assuming that radio waves are the most affected by noise - suggesting that many candidates do not distinguish between *noise* and *interference*. Although many candidates could explain how FM was able to eliminate noise, but AM could not. Many candidates omitted to mention PWM at all, losing a mark.

Q6 Many weak candidates could not draw a bandpass filter based on an LC parallel circuit, often trying to use an op-amp circuit with RC filters instead. However, it was good to find that many able candidates could calculate the size of the inductor, with only the weakest unable to transpose the formula and substitute the correct value. Explaining the operation of the filter was the second stretch-and-challenge question of the paper, so it was not unexpected to find that the majority of candidates earned no marks at all. Most candidates were able to fill in the block diagram correctly, with a substantial minority reversing the filter and the demodulator in the two receivers. The final two-stage calculation discriminated well, with many weak candidates trying to calculate the answer without calculating the bandwidth first.

Q7 Many weak candidates earned few marks in this question about superhet radio receivers. Strong candidates were able to draw correct circuit diagrams for the aerial and tuned circuit, but many were not able to explain the advantage of the RF amplifier - many thought that the demodulation process would not happen if the signal was too small? As expected, only the strongest candidates could suggest a suitable frequency for the local oscillator; it was noted that many candidates failed to provide enough significant figures in their answer. Although many candidates earned full marks for their design of treble cut filter, too many candidates lost a mark by not setting the input resistor to 22 kΩ as specified.

Q8 Although most candidates calculated the correct value for the magnitude of the gain of the amplifier, only the strongest earned the mark by including the sign as well. Many weak candidates failed to recognise the summing amplifier or were unable to use the formula for it, so the next two calculations provided excellent discrimination. However, nearly all candidates could link each part of the transmission system to its function, and most could explain the need for sending information across the link to synchronise the receiver and transmitter.

Q9 This question required candidates to analyse a complex circuit diagram for a serial receiver. Many found it hard to earn the marks. Many strong candidates were unable to calculate the frequency at the output of the counter from the frequency of the oscillator at its input. Very few candidates appreciated the importance of a constant frequency for the oscillators in both transmitter and receiver, However, the majority were able to explain the operation of the circuit when triggered, and many could complete a timing diagram for it. The final circuit diagram for a shift register was correctly completed by many candidates, with weak candidates losing marks by failing to transfer the labels correctly from the circuit diagram at the start of the question.

F616 Design Build and Investigate Electronic Circuits

As was the case for module F613 this year, moderators reported that the centre marking of module F616 was on the whole very good and that few centres required amendments to marks. The same comment made for F613 about the annotation of marks can also be applied to this module and it cannot be overstressed the benefit of using concise comments or references in the report to where criteria have been achieved.

The same centres who submitted samples for F613 using the OCR Repository also did so for F616. Whilst this was only a small number, and paper submission is perfectly acceptable, it was encouraging to see this practice used. As with F613, a small number of clerical errors were also evident with F616 and, again, it was the addition of marks which caused problems. Centres must have these checked by an independent person before submission. Many centres use spreadsheets to record marks and this does help to reduce errors.

The range of projects attempted was also impressive with a number of candidates attempting some very challenging circuits. Many of these candidates produced circuits requiring quite a large number of subsystems; more than the five required to be eligible for the maximum mark of 60/60. However, it must be stated that if the final circuit is not complete, then some marks will not be gained.

Whilst the marking was generally very good this year, small discrepancies still arose and it is instructive to consider the main problem areas:

To achieve high marks for Research, criterion 1a, candidates should offer some useful and relevant numeric or circuit information. For example, if a candidate attempts a motor speed controller circuit using a closed loop system and presents research solely based on the benefits of using closed loop systems, the mark for this criterion not likely to be high.

The specification, criterion 1b, still causes trouble for some. This should contain some numeric information for each subsystem and the final circuit. This enables analysis to be carried out on test results for each subsystem and the final circuit. A poor specification is likely to result in a low mark for criteria 1b, 3c and 3d. Thus, if high marks are to be achieved, it is important to present detailed final circuit and subsystem specifications.

The testing plans (criterion 1c) are often not given the high profile they deserve. Since this is an important aspect of module F613, candidates should apply the same rigour to module F616.

For the designing of subsystems (criterion 2a), if some circuit diagrams are incorrect, then full marks cannot be awarded.

For fault finding (criterion 2e), in order to score high marks, candidates must present the faults and discuss how these were resolved. It was found on several occasions that a report contained no reference to fault finding yet marks had been awarded for criterion 2e.

Some candidates find the analysis of results (criterion 3c) difficult and often present superficial work. If a subsystem or the final circuit has been specified well, then the task facing the candidate is to discuss, quoting evidence, whether the subsystem or final circuit performs as predicted. For example, if a voltage amplifier subsystem is attempted, and the gain is quoted as ten, then the results taken should be analysed to show the actual gain obtained. A brief statement of the kind, ‘as you can see, the subsystem works’, is not analysis and does not score a mark.

For circuit diagrams, criterion 4a, the diagrams must be correct and all components have values indicated. A circuit diagram without values is not counted as a correct diagram.

Finally, for the acknowledgement of sources of assistance (criterion 4d), the acknowledgement should include a detailed reference to the source and what assistance was obtained.

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