GCE A LEVEL EXAMINERS' REPORTS

ELECTRONICS
A LEVEL

AUTUMN 2020

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COMPONENT 1: PRINCIPLES OF ELECTRONICS

General Comments

The paper worked well with a wide spread of marks achieved by the limited number of candidates. Candidates generally attempted most questions with very few parts of questions omitted.

Comments on individual questions/sections

Q1. Generally well answered but not many candidates knew the truth table for the 3-input X-OR.

Q2. Generally well answered but De Morgan's theorem is still a major hurdle for many candidates.

Q3. Part (a) was not well answered. However, part (b) was well answered by many candidates in what is traditionally a challenging task - to explain how an answer is obtained. Part (c) was generally well answered, except for part (c)(iii) describing the relationship between currents and giving a reason for their answer.

Q4. Part (a) was generally well answered but few candidates knew why the multi-stage configuration was better than a single stage. The rest of the question was generally well answered; however, some candidates connected the feedback signal to the non-inverting input in part (b).

Q5. Most candidates scored full marks for part (a). However, in parts (b) and (c), vague statements cost marks. In part (d) many confused TDM with FDM. The majority calculated the minimum bandwidth requirement correctly. In part (e) many encountered problems with performing calculations involving logarithms (or even ratios).

Q6. Generally, a poorly answered question with some answers too vague to merit marks and there seemed to be widespread confusion over the terms 'resolution' and 'sensitivity'. In part (d) the common error in the graph was to draw V_{OUT} as a positive voltage.

Q7. There were some good answers to this question, for the unfamiliar application of Grey code. Most completed the remaining two segments of the track correctly. Part (b) was very well answered by most with the only error being missing the 0.7V at the base of the transistor and assuming the full 3.7V from the sensor appeared across resistor R_2. In part (c) errors included problems performing calculations involving MOSFETs and misunderstanding the data given in the table and circuit diagram.

Q8. Part (a) required the signal frequency to be calculated in order to identify the position of the signal on the E/M spectrum. In part (b) only a minority attempted to draw an amplitude-modulated waveform. Other candidates drew single frequency sine waves. Part (c) some candidates struggled to tackle this question, starting with the circuit diagram for the band-pass filter.

Q9. In part (a) many candidates were unable to use the bridge circuit information given in the question and tried to find answers by combining resistors rather than using the voltage-divider formula. In part (b) most correctly identified the required voltage gain. However, few candidates knew the circuit diagram for a difference amplifier or identify which resistors were which. In part (c) many missed recognising the need for a second 'dummy' strain gauge.

Q10. This was the QER question. Most candidates attempted calculations to evaluate the performance of the circuit. Most concluded that a problem was that the lamp would light during the daytime. However, very few were able to suggest realistic improvements to the circuit.

Summary of key points

- Candidates must be able to apply De Morgan's theorem.
- Candidates should practice writing answers that explain complex concepts.
- Candidates must be able to carry out calculations involving logarithms.

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COMPONENT 2: APPLICATION OF ELECTRONICS

General Comments

The paper worked well with a wide spread of marks achieved by the limited number of candidates. Candidates generally attempted most questions with very few parts of questions omitted.

Comments on individual questions/sections

Q1. Generally well-answered. The common problems were the clock connections in (b) and the reset in (c). Poor labelling of the outputs lost marks.

Q2. Again, a good overall performance, though the clock connections in part (c) caused problems.

Q3. Many confused the roles of the PORT B and TRIS B registers in (a). All offered some analysis of the program, some more detailed and accurate than others. Common issues were the actions of the bit-testing instructions and the use of 'call' to invoke a subroutine.

Q4. Candidates struggled with the mathematical formulae in parts of this question. In (a) (iii), there was confusion about the initial state of the LED but widespread agreement that something happened after 3.29s.

Q5. In (a), a common error was the modulated PWM or PPM pulses began before the arrival of the triggering pulse. Poor quality explanations and an inability to structure convincing calculations limited marks in later sections.

Q6. Parts (a) and (b) saw poor understanding of dispersion and its causes and regeneration and its benefits. Only the most able candidates were able to calculate the switching thresholds, but all knew of their effect and drew accurate output signals. Common faults in (c) with drawing the shift register were clocking and labelling. There were very few correct timing diagrams in (d), though most drew the correct output signal at Q_A.

Q7. Most parts of this question were well answered. The common error was to use the wrong frequency in the ripple voltage calculation.

Q8. Part (a)(i) produced few correct answers though most calculated the voltage drop across the resistor correctly. In part (ii), most calculated the power rating for the resistor correctly, but a common error was getting the power rating for the Zener wrong by using the minimum value of current through it rather than the maximum. In part (b), there were few correct answers, especially for part (ii).

Q9. In (a), many failed to identify the power amplifier block. In (b), all knew that the inverting input sits at 0V, but few were able to use the equation for the mixer correctly. The MOSFET push-pull source follower circuit was not well known for (d). Symbols for the MOSFET were often incorrect, and some drawings made it impossible to determine whether a complementary pair was used, or to recognise which terminal was which. In (e), on a key topic, most scored some marks, the common error was the position of the capacitor.

Q10. In part (a), most answers were too vague. The symbol for the thyristor in (b), was not well known. In (b)(ii), most chose peak values of voltage and current. Calculating maximum resistance requires minimum values. In part (c), some sketches again were too poor in quality to earn marks.

Summary of key points

- Candidates should use pencil and ruler to draw circuit diagrams and use correct circuit symbols.

- Candidates must be able to sketch graph traces of several cycles to a reasonable level of accuracy. Ghosting in lightly before committing to an answer would minimise untidy rubbing or scribbling out.

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