

## **2010 HSC Industrial Technology Electronics Technologies Sample Answers**

This document contains 'sample answers', or, in the case of some questions, 'answers could include'. These are developed by the examination committee for two purposes. The committee does this:

- (a) as part of the development of the examination paper to ensure the questions will effectively assess students' knowledge and skills, and
- (b) in order to provide some advice to the Supervisor of Marking about the nature and scope of the responses expected of students.

The 'sample answers' or similar advice are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

## Section II

### Question 11

*Sample answer:*

The LDR detects a light source has changed, or a light beam has been broken, and turns transistor switch 1 on activating the bistable movement and turning the siren on.

### Question 12

*Sample answer:*

When transistor switch 1 has been turned on the siren will sound continuously. The bistable switch shown is a reset, which is used to produce a short, low pulse at the reset input. The bistable will change state with Q going low and switching the siren off.

### Question 13

*Sample answer:*

The digital simulation of an electronic circuit permits the safe experimentation and evaluation of a circuit design, including determining expected output(s) for given input(s).

Experimentation could include:

1. The changing of circuit component types as well as their values and configuration with other components.
2. Fault finding of potential circuit problems.

## Question 14

*Sample answer:*

Property	Bipolar transistor	FET
Conversion	Current to current	Voltage to current
Input current	Required	Not required
Input/output relationship	Linear	Not linear for large signals, may lead to distortion
Speed		Switch faster than bipolar
Input voltage	Base-emitter voltage = .07V whatever the size of the input current	Switches on when the gate-source voltage exceeds the threshold voltage. Can be any value between the threshold and supply voltage
Input resistor	Required	Not required
Output resistance		Generally less than 1, therefore good transistor switches

## Question 15

*Sample answer:*

$$\begin{aligned}
 V_4 &= I_4 R_4 \\
 &= 0.9 \times 20 \\
 &= 18\text{V}
 \end{aligned}$$

$\therefore$  Voltage drop across ( $R_2$  and  $R_4$ ) = 18V (Parallel to  $R_4$ )

$$\begin{aligned}
 R_5 &= R_2 + R_3 \\
 &= 14 + 16 \\
 &= 30\Omega
 \end{aligned}$$

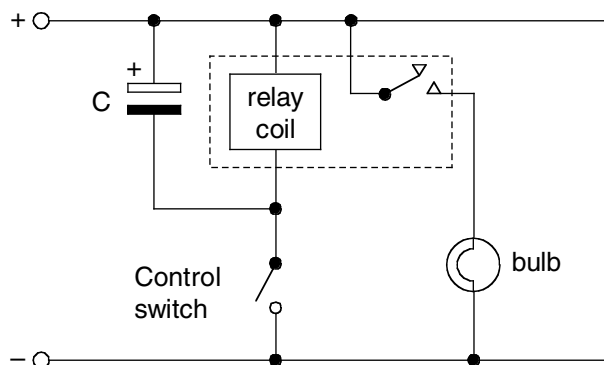
$$\begin{aligned}
 \therefore I_{2,3} &= \frac{V_4}{R_5} \\
 &= \frac{18}{30} \\
 &= 0.6\text{A}
 \end{aligned}$$

$$\begin{aligned}
 \therefore V_3 &= I_{2,3} R_3 \\
 &= 0.6 \times 16 \\
 &= 9.6\text{V}
 \end{aligned}$$

$$\begin{aligned}
 \therefore P_3 &= V_3 I_{2,3} \\
 &= 9.6 \times 0.6 \\
 &= 5.76\text{W}
 \end{aligned}$$

## Question 16

*Sample answer:*



The capacitor needs to be in parallel with the relay coil.

When the control switch is closed, the bulb is turned on. The capacitor also becomes charged. When the control switch is opened, the relay will remain turned on for a few seconds while the capacitor discharges. This also keeps the bulb turned on until the capacitor discharges.

## Section III

### Question 17 (a)

*Answers could include:*

Environmental considerations which may affect a decision to expand a company or relocate:

- Change in distance from markets/storage/logistics
- Change in distance from suppliers
- The type of manufacturing process involved in the production
- The opportunities to save or recycle waste
- The greater or lesser use (demand for) utilities such as water, electricity, gas and storage
- The environmental consideration of relocating the staff

**Question 17 (b)*****Answers could include:***

Small business must assess what stage the business is currently in (establishment, growth, maturity or post-maturity phase) and what business plan they have for the next five years and/or succession planning. The business is relocating to enable expansion.

***Structural Issues:***

- Relocating will enable the adoption of new strategies in production layout, storage, prototype and development work
- The outsourcing of some production would permit reduction in staff numbers or multi-skilling
- Promote multi-skilling, as job skill enlargement and/or job enrichment. It brings about better management structure with employees getting more responsibility, more job satisfaction, and probably more pay

***Technical Issues:***

- Opportunities to adopt new technologies both in production and administration
- Better production flow
- Better quality control measures can be introduced
- Introduce newest and latest means of production
- Enable a true comparison with competitors
- Whereas some jobs may become redundant other new jobs will be established
- Gives opportunities for retraining/multi-skilling

***Personnel Issues:***

- Trained, experienced and loyal staff members are a business's greatest asset.
- Any change must be "sold" to staff emphasising the improvement and advantages they will be part of
- Change in technology and structure will infringe on staff and therefore care should be taken not to alienate key staff
- Key staff are identified by using a personnel skills audit process looking at an individual's experience, skills and personal qualities
- A change is also a chance to "cull" personnel that fail to contribute
- Retrained, up-skilled, multi-skilled and loyal employees should be recognised publicly and rewarded