VCE VET Integrated Technologies

Written examination – End of year

Sample questions

SECTION A – Multiple-choice questions

Question 1
Consider the following steps in the planning of an integrated technologies project.

V	Evaluate the suitability of technologies and connectivity programs.
W	Respond to supervisor feedback.
X	Prepare a project brief.
Y	Establish the project team.
Z	Create an action plan.

The correct order of these steps when planning an integrated technologies project would be
A. Y, X, V, Z, W.
B. V, X, Y, W, Z.
C. X, Y, V, Z, W.
D. Y, V, X, Z, W.

Question 2
If portable electrical equipment is used to build a prototype in a workshop, what should be checked first?
A. That the electrical lead is in good condition.
B. That the electrical plug is the right connection.
C. That the equipment has the correct safety tag and date.
D. That the electrical operation has been tested before use.

Question 3
To evaluate the performance of an integrated technologies project, you should
A. respond to supervisor feedback.
B. test the project against the project brief.
C. make modifications to improve product performance.
D. undertake a review of the processes used by the project team.

SECTION B

Question 1 (13 marks)

The company you work for has been commissioned to design, program and install a light indication module on a conveyor system. The purpose of the indicator lights is to provide staff with visual cues in order to reduce product handling errors. It is expected that the initial specifications may need to be adjusted after testing.

The conveyor system is shown in Figure 1 below. After the product has been placed on the conveyor belt, it is to be detected at an optical sensor switch, switch A, when a green indicator light will come on.

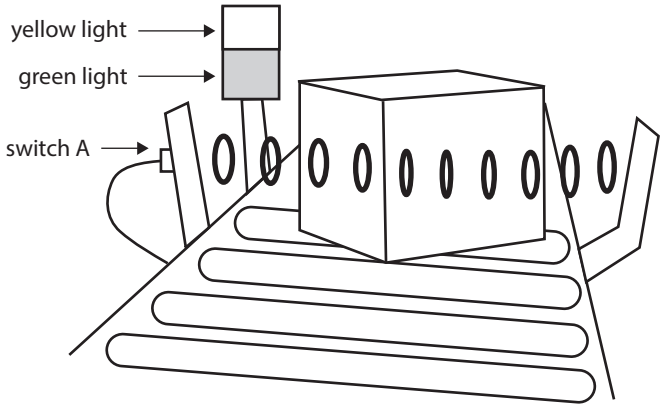


Figure 1

After the green light turns off and the product moves along the conveyor belt, both yellow and green indicator lights will come on. After a delay, the yellow indicator light will turn off and then the green light will turn off. As the product reaches the end of the conveyor belt, the light sequence will then be repeated 12 times, ready for the next product to enter and activate switch A.

Project Brief

Available equipment:

- programmable logic controller
- optical sensor switch
- indicator lamps
- control box
- associated wiring

Project time:

You have been allocated four hours to install the system, during the nightly shutdown for maintenance.

Specifications:

- The light sequence starts when limit switch A is activated by a product passing through the optical sensor.
- The light sequence must operate as follows:
  - The green light is switched on for five seconds before being switched off.
  - After two more seconds, both the yellow and green lights are switched on.
  - After three more seconds, the yellow light is switched off.
  - After one more second, the green light is switched off.
- The light sequence must repeat 12 times, after which the next product will be placed on the conveyor.

a. Use the project brief on page 2 to list all the deliverables for the project in the order in which they would be completed. 2 marks

b. Describe **three** project stages that could appear in an action plan for this project. 3 marks

c. Identify **two** safe work practices that should be followed by the students working on this project. 2 marks

d. Figure 2 shows a flow chart for the light sequence designed by the project team.

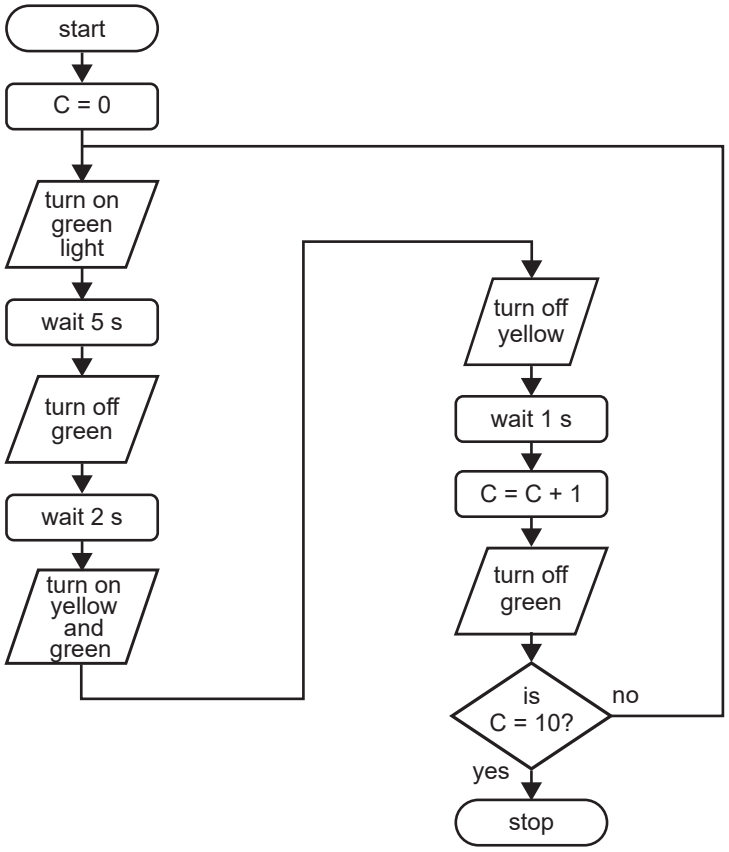


Figure 2

Evaluate the function of the system shown in the flow chart above against the specifications given in the project brief on page 2, and suggest any improvements and/or corrections required to fully meet the specifications. 6 marks

Question 2 (10 marks)

You are part of a team that has been asked to construct a micro-based control system of an extra-low voltage (ELV) security system for an Integrated Technologies project. The ELV security system has four infrared sensors and one audible alarm speaker, and is to be installed in a weather-prone location on a brick wall.

The stages that could be carried out to complete the project are listed below.

1. Design the circuit schematic.
2. Design the printed circuit board (PCB).
3. Create prototypes using the selected design.
4. Evaluate and debug the prototype.
5. Program the microcontroller.
6. Test the microcontroller program and debug the program.
7. Install the control circuitry in the enclosure.
8. Mount the enclosure in location and test for operation.

a. Suggest how the team could ensure that the stages of the project are achieved on time. 2 marks

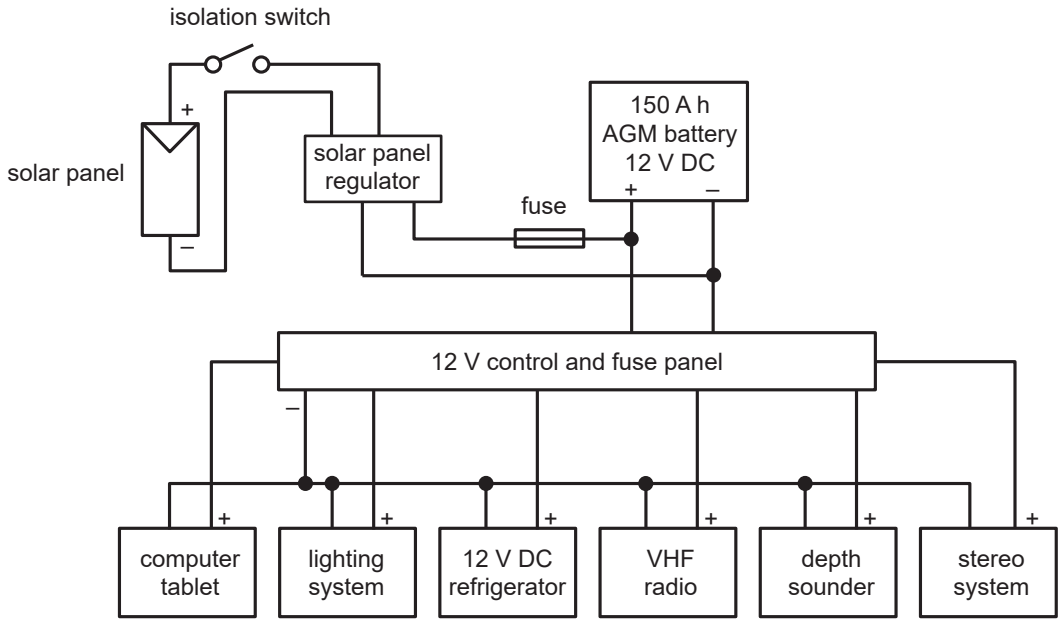
b. Describe how the team could evaluate different circuit design options against the project brief to enable them to recommend the best design option. In your answer, refer to the types of equipment and processes that could be used. 4 marks

c. Explain how the prototypes produced could be evaluated to ensure that they would operate satisfactorily in the required location. 2 marks

d. Explain how the team could test and debug the microcontroller program. 2 marks

Question 3 (16 marks)

Michael has recently been asked to work on the electrical system of a client's small yacht. The client wants to go sailing for up to five days without having to recharge the battery from an external power source. Michael's intention is to wire a 12 V system with a solar panel and a 150 A h capacity Absorbent Glass Mat (AGM) battery. A block diagram of the system is shown below.



a. Complete the table below by using the information given above to outline a project brief for the work on the client's yacht. 5 marks

Aspects of project brief	Outline
type of project	
expected project outcome	
integrated technologies to be merged	
suitable connectivity programs	
resources required	

b. The table below lists the average daily usage and required current for each device used in the yacht's electrical system.

i. Complete the table below by listing the daily ampere hour requirement for each device and the total daily ampere hour requirement. 3 marks

Device	Average daily usage (hours)	Current required by device	Daily ampere hour (A h) requirement
computer tablet	3	1 A	
lighting system	4	400 mA	
12 V DC refrigerator	8	2.5 A	
VHF radio	6	400 mA	
depth sounder	4	1.8 A	
stereo system	8	1 A	
Total daily ampere hours (A h)			

ii. Calculate the total ampere hour usage for five days. 1 mark

Total ampere hour usage for five days	A h

The 12 V DC 150 A h AGM battery can be discharged down to 50% of its capacity without causing any internal damage. A suitable solar panel is required to supply the required current.

c. In the table below, record the five-day ampere hours to be supplied by the solar panel. 1 mark

Total ampere hour usage for five days (from **part b.ii.**)	
Battery ampere hour capacity at 50%	
Five-day ampere hour supply by solar panel	

d. If the solar panel operates for an average of six hours per day (full sunlight), how much current does the panel need to provide? Show your working. 2 marks

Current to be provided by the solar panel during full sunlight	A

e. Calculate the minimum power required from the solar panel. 1 mark

f. **i.** The power ratings for three solar panels are given below. Circle the lowest-power-rated panel that could achieve the outcomes of the project brief. 1 mark

12 V DC, 60 W 12 V DC, 80 W 12 V DC, 100 W

ii. Explain how Michael could demonstrate that the outcomes of the project brief have been met. 2 marks

Answers to multiple-choice questions

Question	Answer
1	A
2	C
3	B