



*Rewarding Learning*

**ADVANCED**  
**General Certificate of Education**  
**2015**

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## **Technology and Design**

**Assessment Unit A2 1**

*assessing*

**Systems and Control**

**and**

**Product Design**

**[AV211]**

**TUESDAY 2 JUNE, MORNING**

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**MARK  
SCHEME**

## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

In all cases credit will be given to suitable alternative answers.

AVAILABLE MARKS

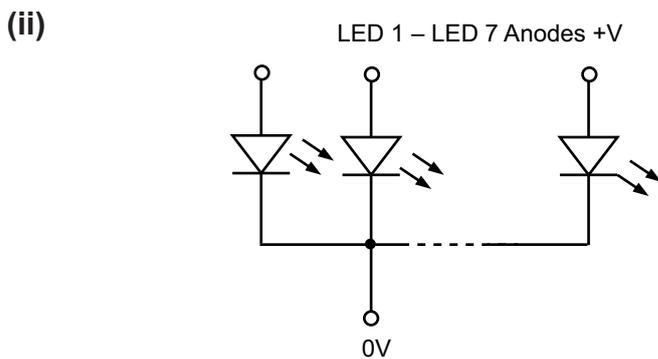
**Section A**

1 (a) (i) LCDs generally have a low power consumption making them an efficient option. [1]

(ii) The system can be considered as continuous because the variable resistor operates over a resistance range rather than simply having two states. [2]

(iii) Power dissipation =  $V \times I$   
 where  $V = 2.5$  volts and  $I = 2.5/110 = 22.7$ mA  
 therefore  $P = 56.8$  mW [2]

(b) (i) A main advantage from one of the following:  
 • high visibility even in bright daylight – LCDs may require backlighting  
 • more robust construction – LCDs require extra layers to protect the screen  
 • wide viewing angle – LCDs have limited viewing angle. [1]



(iii)  $R = V/I$   
 Where  $V = 5 - 2.2 = 2.8$  V and  $I = 16$  mA  
 Therefore  $R = 175$  ohms [2]

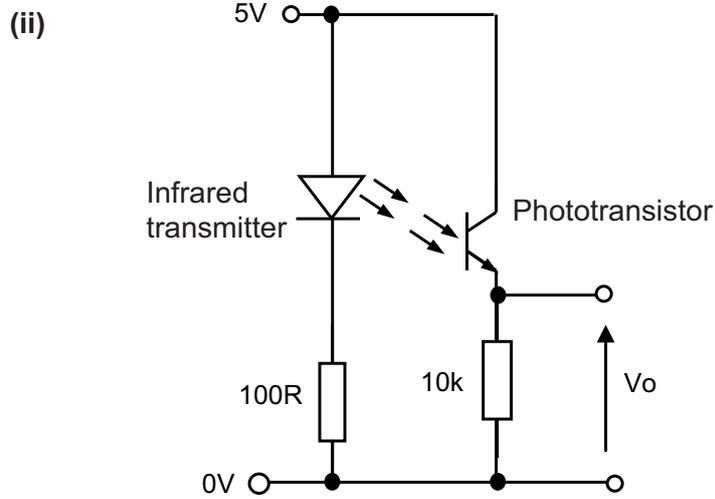
(c)

A	B	C	D	a	b	c	d	e	f	g
				1	0	1	1	0	1	1
0	1	1	0							

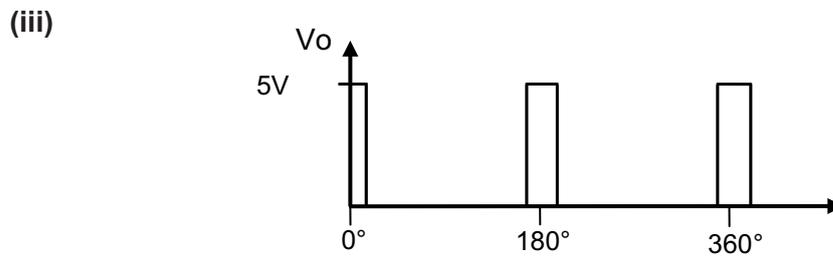
[2]

- (d) (i) One main advantage – the infrared transmitter and phototransistor provide no resistance to wheel movement.

One main disadvantage – brake disc may come into contact with mud or debris that could obscure passage of infrared transmitter. [2]



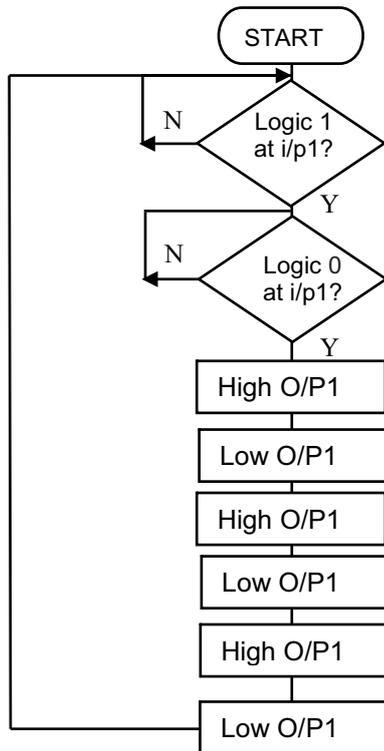
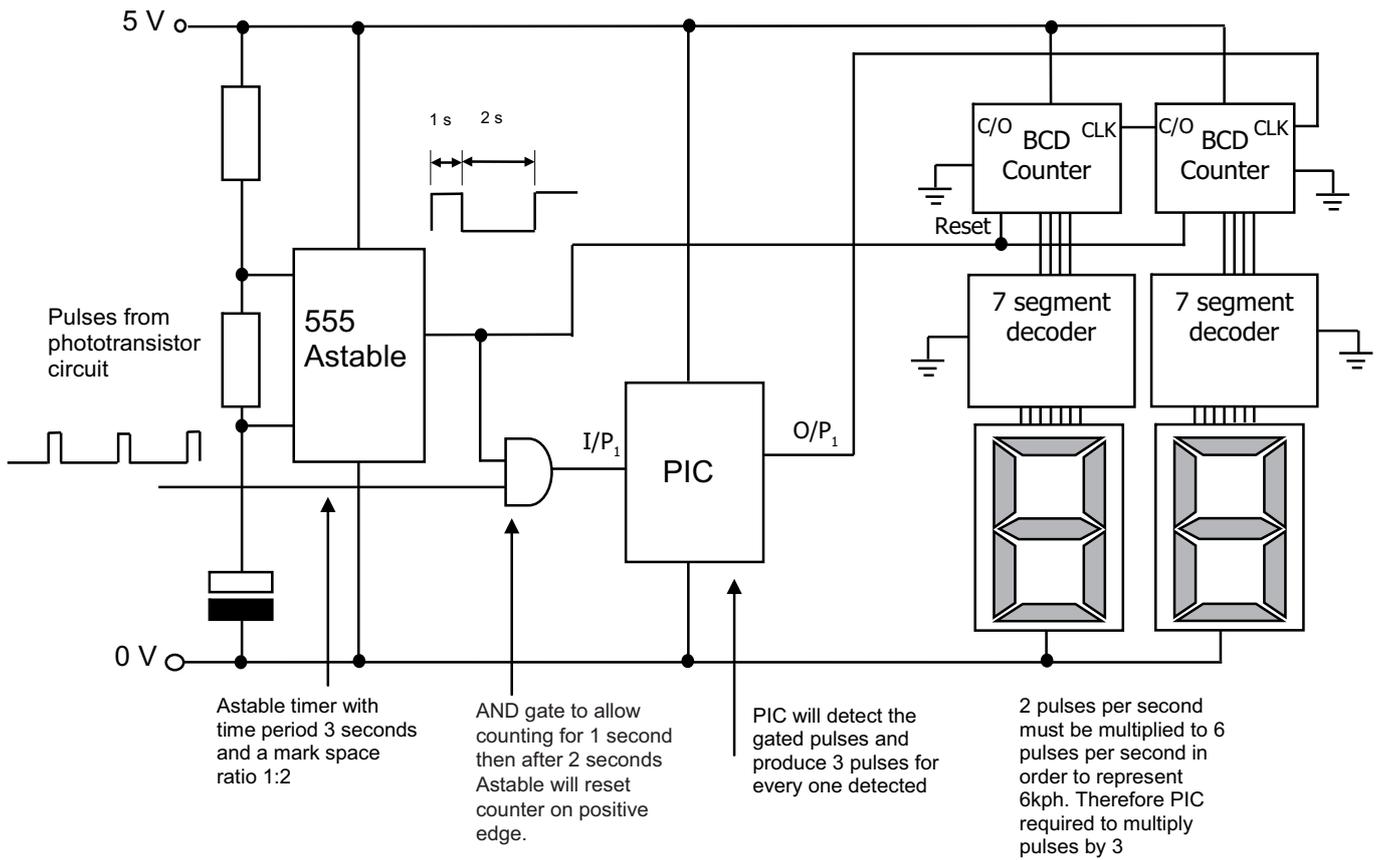
[4]



[3]

AVAILABLE  
MARKS

(e)



Each time a pulse from the photo transistor is detected, three pulses in quick succession are produced to display the correct speed in kph.

AVAILABLE MARKS

[10]

(f) Discussion likely to refer to any three of the following factors:

Environment. The conditions a sensor will be exposed to during normal operation must be considered. Dusty, damp conditions or vibration may cause some sensors to malfunction. Extreme heat and cold may alter the performance of the sensor itself. Some sensors will therefore require protection or specialised housing.

Analogue or digital requirements. Micro switches and reed switches are used to sense movement and produce on/off or simple digital outputs. Thermistors and LDRs are analogue components that will produce a range of values for example when used in a thermometer or lightmeter.

Responsiveness/sensitivity. The response time of sensors may be a critical factor where changes in conditions must be detected instantly. For example the response time for a phototransistor can be much quicker than for an LDR. The degree of sensitivity must also be considered as it may be necessary to sense very small changes in conditions.

Characteristics. Sensors may have linear/logarithmic/proportional/inversely proportional response to the conditions they are sensing. This may require calibration or conditioning.

Size. Some applications may require small or unobtrusive sensors which are capable of fitting into limited space.

Example 1. An LDR used to detect low light levels in order to switch on a security light. A fast response time is not critical and the LDR could be housed under a small plastic window in order to protect it from harsh weather conditions. The LDR can be calibrated or adjusted to cause the light to switch on at different levels. A large LDR will be acceptable as the case for the security light is not restrictive.

Example 2. A reed switch used to detect a door or window opening and closing for a burglar alarm system. This type of sensor requires a power supply only to one side making it suitable for this application as they are robust and easily fitted to a variety of doors and windows where a simple digital signal is required.

[5]

AVAILABLE  
MARKS

## Quality of written communication

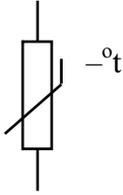
For a response not worthy of credit.	0
Poor selection and use of a writing form and style appropriate to the content. The content is poorly organised and little use is made of appropriate technological vocabulary. The writing is barely legible and the spelling, grammar and punctuation are inaccurate.	[1]–[2]
Good selection and use of a writing form and style appropriate to the content. The content is organised and use is made of appropriate technological vocabulary. The writing is legible and the spelling, grammar and punctuation are accurate.	[3]
Very good selection and use of a writing form and style appropriate to the content. The content is well organised and good use is made of appropriate technological vocabulary. The writing is clearly legible and the spelling, grammar and punctuation are very accurate.	[4]

[4]

40

AVAILABLE  
MARKS

2 (a) (i)

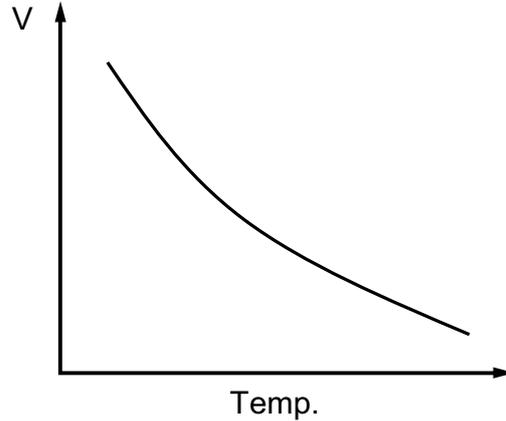


[1]

(ii) The purpose of a voltage divider circuit is to produce an output voltage ( $V_o$ ) that is a fraction of its input or supply voltage.

[2]

(iii)



[2]

(iv) At  $10^\circ\text{C}$  resistance of  $R_t = 7\text{k}$  (accept to  $7.3\text{k}$ )

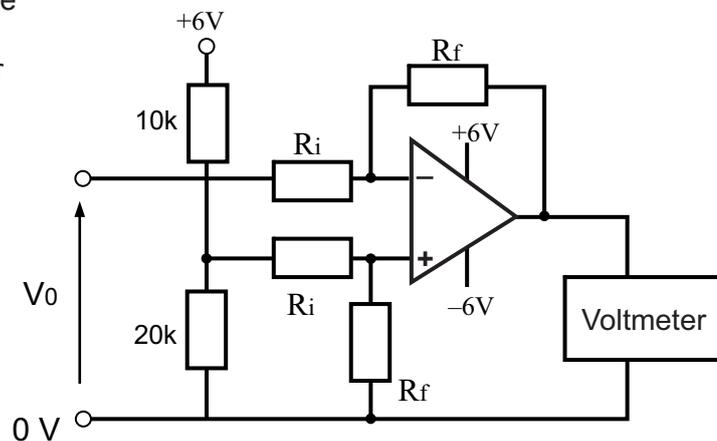
$$V_o = \frac{7}{17} \times 6 = 2.47 \text{ volts}$$

At  $30^\circ\text{C}$  resistance of  $R_t = 4\text{k}$

$$V_o = \frac{4}{14} \times 6 = 1.71 \text{ volts}$$

[2]

(b) 4–2 volts from voltage divider must display as 0–40 on voltmeter. Therefore a gain of 20 is required. The output from the voltage divider can be connected to the inverting input of a differential amp. A voltage divider to give 4 volts at non inverting input of a differential amp is also required.

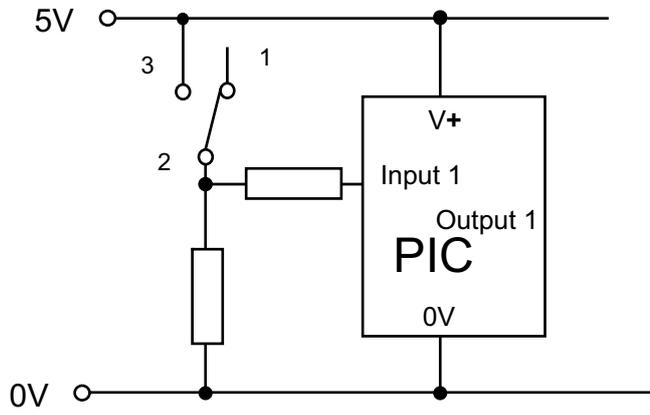


$$\frac{R_f}{R_i} \text{ must} = 20 \text{ with min. value of } 1\text{k}$$

[6]

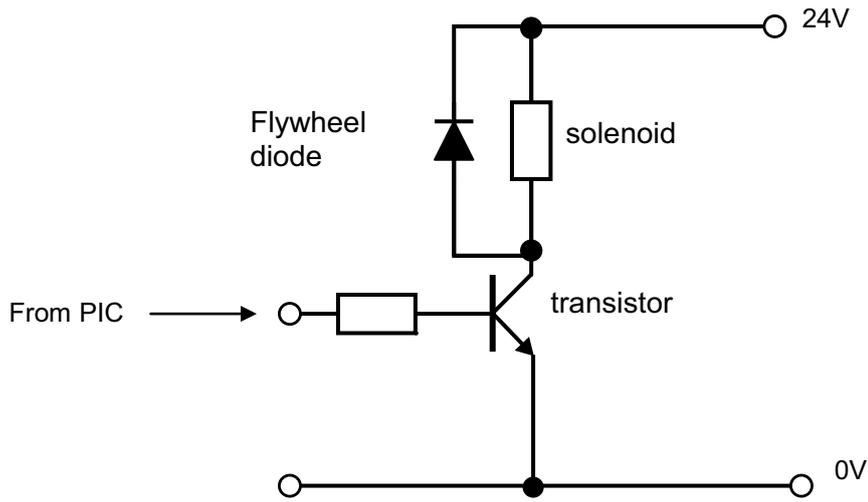
AVAILABLE MARKS

(c) (i)



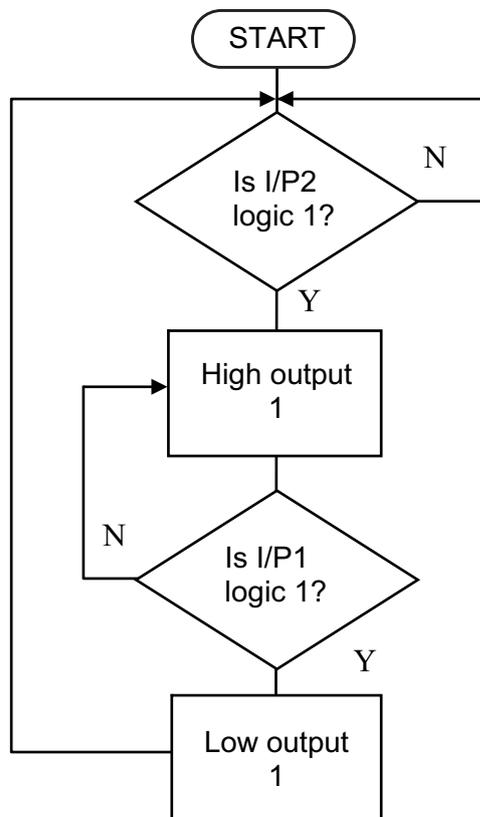
[2]

(ii)



[2]

(iii)



[4]

AVAILABLE MARKS

(d) (i)

S1	S2	S3	Q
0	1	0	1
0	1	1	1
1	0	1	1
1	1	0	1

[4]

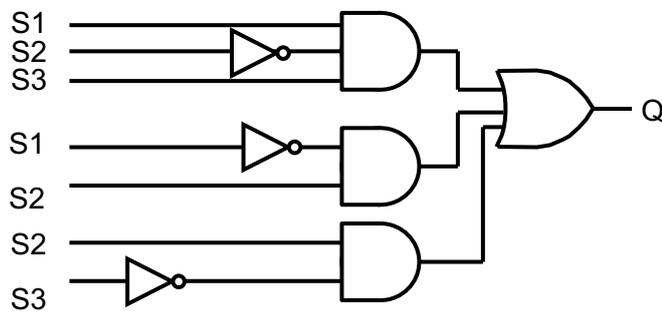
(ii)

S1 S2	00	01	11	10
S3				
0	0	1	1	0
1	0	1	0	1

$$Q = S1\bar{S}2 + S2S\bar{3} + S1S\bar{2}S3$$

[3]

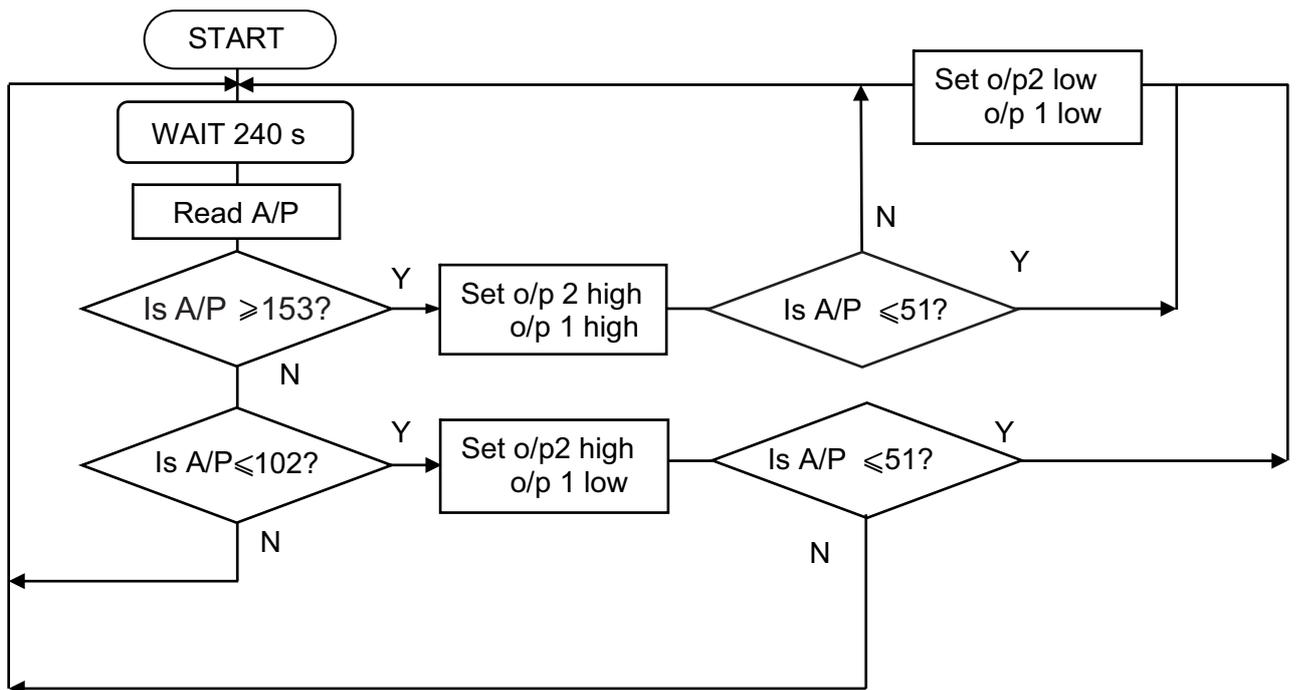
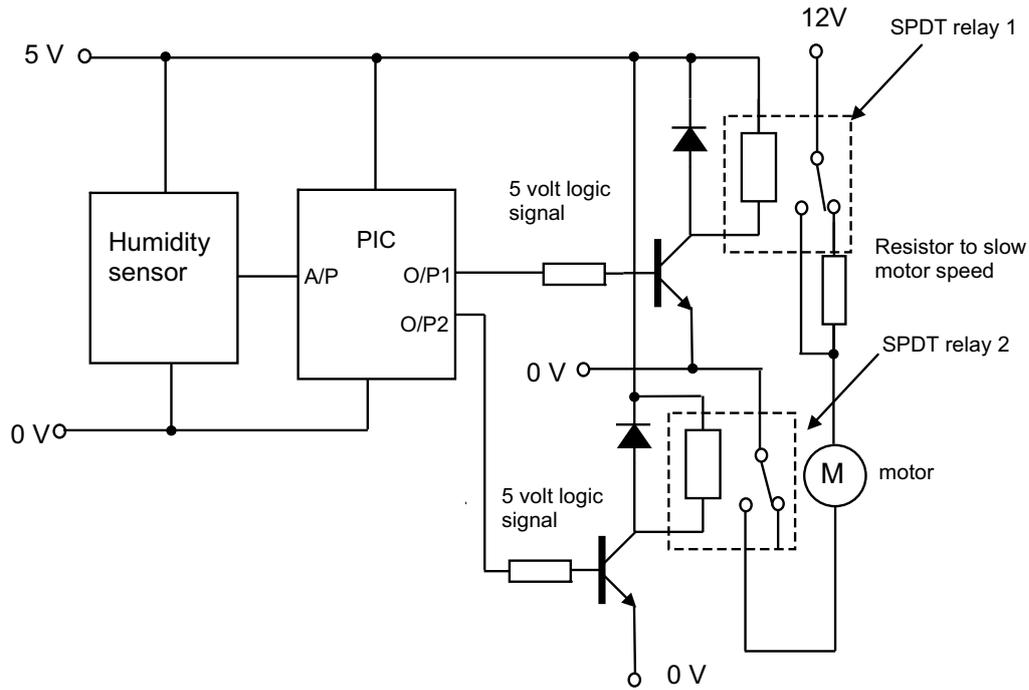
(iii)



[2]

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(e) Sample answer



[10]

Section A

AVAILABLE MARKS
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80

## Section B

AVAILABLE  
MARKS

- 3 (a) (i) Any **two** from the following:
- Moving parts
  - Heat from friction
  - Noise from components
- [2]
- (ii) Annotated sketch of a taper bearing coping with axial and radial loading. Double taper may also be used. [3]  
 Method to secure [1]  
 Lubrication [1]
- (iii) *Two comparisons between Roller and Self-Aligning Bearings:*
- Roller bearings do not allow for shaft misalignment, self-aligning allow for shaft misalignment
  - Roller bearings have cylindrical rollers inside – self-aligning tend to use ball rollers.
- [2]
- (b) (i) Annotated sketch to include the following:
- Pads
  - Pivot
  - Linkage
- [3]
- (ii) Gain in PE = mgh  
 $7021.3\text{ J} = 65 \times 9.82 \times ?$   
 $65 \times 9.82 = 638.3$   
 $7021.3/638.3 = 11\text{ m}$
- [3]
- (iii)  $P = \text{work/time}$   
 $P = 800\text{ N} \times 3.0\text{ m}/30\text{ sec}$   
 $P = 80\text{ W}$   
 $= 80 \times 100/75$   
 $= 106.7\text{ W}$
- [3]
- (iv)  $P = T\omega$   
 $P = 260 \times \omega$   
 $260 \times (2\pi/60 \times 1400\text{ rpm})$   
 $P = 260 \times 146.53$   
 $P = 38098\text{ W}$   
 $P = 38.1\text{ kW}$
- [3]

**(c) Diaphragm Clutches**

Any one of the following advantages:

Offer soft start-up, swift gear shifting, vibration damping and noise minimisation.

Any one of the following disadvantages:

Need a manual input to move the driver shaft.

The diaphragm spring is significantly noticeable to the operator as they have to apply less pressure on the pedal due to the lower engaging force.

**Centrifugal Clutches**

Any one of the following advantages:

Are automatic, relatively simple and inexpensive in construction. This type of clutch disengages with ease and while idle, while also being very versatile with a variety of outputs.

Any one of the following disadvantages:

Insufficient torque for larger machinery.

Not suitable for low RPM applications.

Justification:

Hydraulics used due to heavy load of lorry and cargo.

[5]

Quality of written communication

Level of response not worthy of credit.	0
Poor selection and use of a writing form and style appropriate to the content. The content is poorly organised and little use is made of appropriate technological vocabulary. The writing is barely legible and the spelling, grammar and punctuation are inaccurate.	[1]–[2]
Good selection and use of a writing form and style appropriate to the content. The content is organised and use is made of appropriate technological vocabulary. The writing is legible and the spelling, grammar and punctuation are accurate.	[3]
Very good selection and use of a writing form and style appropriate to the content. The content is well organised and good use is made of appropriate technological vocabulary. The writing is clearly legible and the spelling, grammar and punctuation are very accurate.	[4]

[4]

**(d) (i) Sample Answer:**

Suitable attachment to box with toggle clamps located inside locking area.

Level of response not worthy of credit.	0
Poor sketches with little or no annotation.	[1]
Annotated sketches are limited of a mechanical system which is quick and secured within locking area.	[2]–[3]
Detailed annotated sketches of a mechanical system which is quick and secured within locking area.	[4]

[4]

AVAILABLE  
MARKS

(ii) Sample Answer:

A manually operated system utilising a screw thread with a parallel linkage and suitable attachment to pivot points and base

Level of response not worthy of credit.	0
Poor sketches with little or no annotation. Difficulty in deciding if the manually operated mechanical system will raise, lower and lock the platform with attachment to pivot points and base.	[1]–[2]
Annotated sketches are limited. The design could be suitable for a manually operated mechanical system which will raise, lower and lock the platform with attachment to pivot points and base.	[3]–[4]
Detailed annotated sketches. The design is suitable for a manually operated mechanical system which will raise, lower and lock the platform with attachment to pivot points and base.	[5]–[6]

[6]

40

4 (a) (i)  $W = F \times L$   
 $= 600 \times 0.4$   
 $= 240 \text{ J}$  [1]

(ii) Open loop describes a system in which the building blocks connect in a linear way, i.e. operator pressing a valve to operate a cylinder to stamp a box. The cylinder will go positive and negative only with the command of the operator. [1]

A closed loop describes a system with feedback, i.e. operator pressing a valve to operate an automatic return cylinder to stamp a box. The cylinder will go positive and negative in an automatic manner as it will be detected when fully outstroked. [1]

Feedback is used in only closed loop systems

(iii)  $F = P \times A$  Total force = 6154.4 N  
 $6154.4 \text{ N} = 0.4 \times A$   
 $15386 = A$   
 $70 \text{ mm} = \text{radius}$  [3]

(b) (i)  $\text{Volume} = \frac{S \times D^2 \times (P+1)\pi}{4} + \frac{S \times (D^2 - d^2) \times (P+1)\pi}{4}$   
 Volume =  
 $300 \times 80^2 \times (5+1) \times 3.14 / 4 + 300 \times (80^2 - 25^2) \times (5+1) \times 3.14 / 4$   
 Volume = 9043200 + 8160075  
 Volume = 17203275 ml<sup>3</sup> = 17.203 litres [5]

(ii) Pressurised air is reflected off the object to be detected. [2]

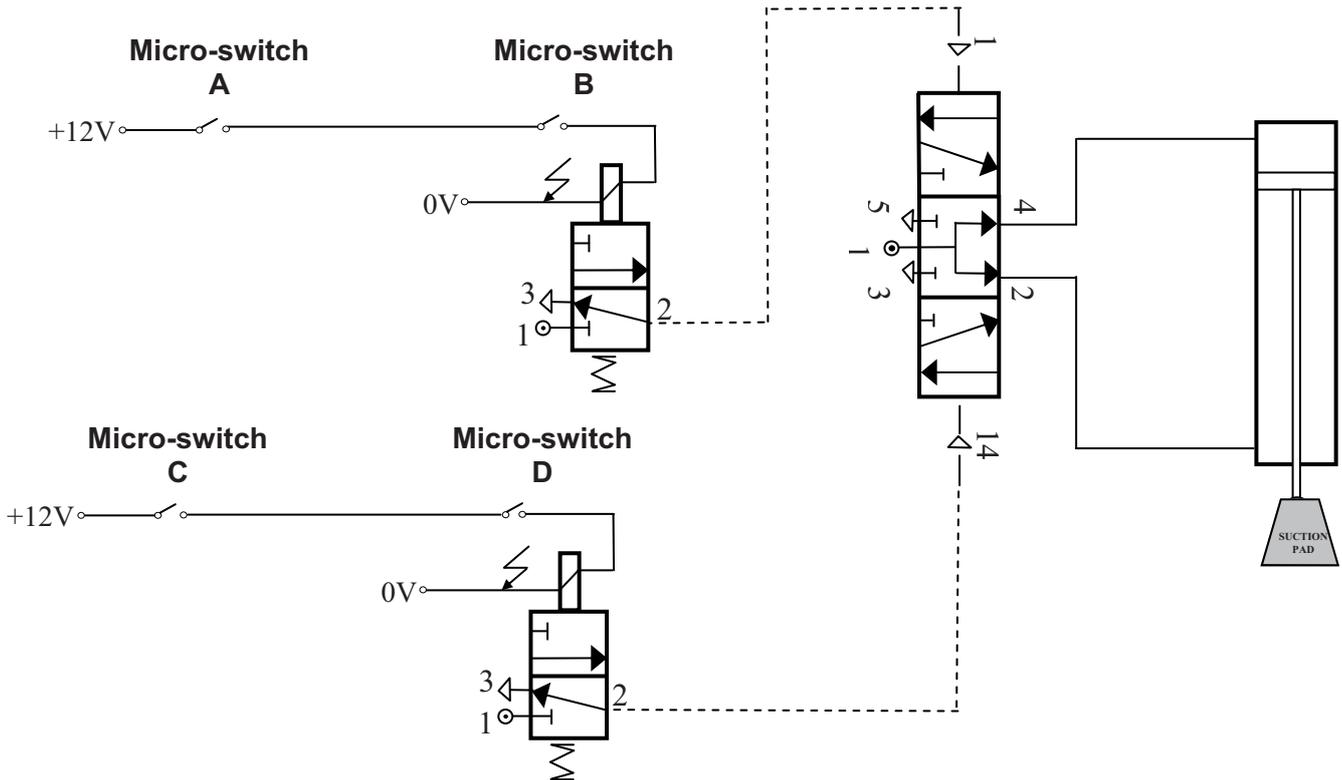
(iii) O-Rings advantages (any **two**):

- They are inexpensive
- Are very reliable
- Easy to make
- Have simple mounting requirements. [2]

- (c) Method of activating X + A+ W- [3]
- Method of activating W+ A- [2]
- Method of activating SAC with speed control [1]
- Method of activating B+ B- X- [3]
- Emergency Stops [2]
- Air Bleed [1]
- Time Delay [1]
- Micro-switch with 3/2 valve [1]
- Changeover valve piping [1]

See A3 sample answer

(d) Sample answer

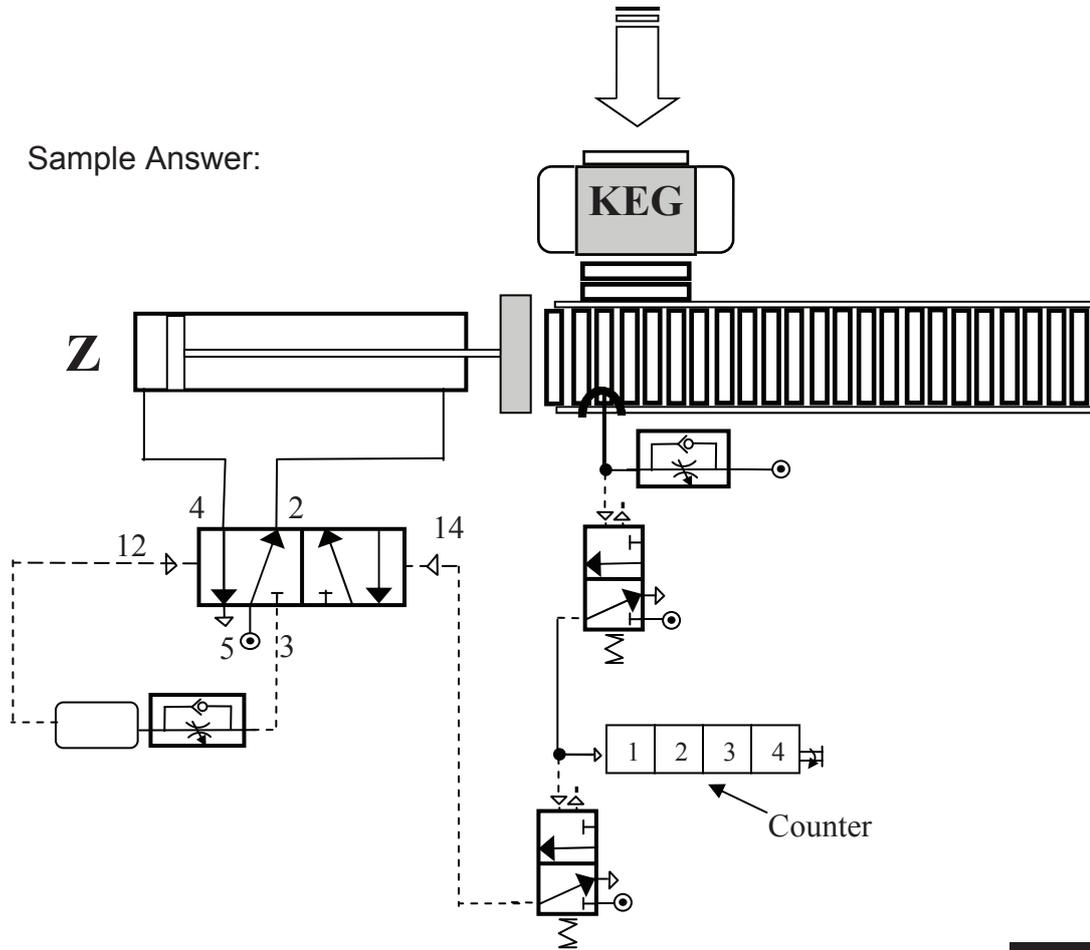


Level of response not worthy of credit.	[0]
Partially functional system using a number of components	[1]–[2]
Functional system which uses more than the minimum number of components	[3]
Fully functional system which uses the minimum number of components	[4]–[5]

[5]

AVAILABLE MARKS

- Sample Answer:



Level of response not worthy of credit.	[0]
Partially functional system using a number of components	[1]–[2]
Functional system which uses more than the minimum number of components	[3]
Fully functional system which uses the minimum number of components	[4]–[5]

[5]

Section B

AVAILABLE MARKS	
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## Section C

## Product Design

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MARKS

- 5 (a) (i) The purpose of market research – To gather information to allow a company to identify their consumers' buying habits and their attitudes towards current and future products. [2]
- (ii) Market research needs to be representative to ensure that the information collected will be balanced to help guide the direction the company takes as it strives to fully reflect the views, attitudes and spending habits of the consumer. [2]
- (b) (i) Any **two** main characteristics associated with incremental product developments from the following:  
 • They are products using existing technologies  
 • They are less costly than radical products  
 • They require low level of marketing. [2]
- (ii) Any **three** main characteristics associated with Technology push from the following:  
 • New technologies make products that were previously impossible, possible  
 • New products developed long before the old ones wear out  
 • New technologies are sometimes driven by environmental product pressures  
 • New technologies are used as a way of achieving an advantage in the market. [3]
- (c) Any **five** international and/or local differences from the following:

## Example 1

Each country may use a different voltage, and aside from knowing the voltage type of a specific country, you also need to pay more attention to the type of outlet and plugs that are being used in that place. Here is a short list of the country voltage, e.g. Australia 240 V, Brazil – 120/220 V, Canada – 120 V, China – 220 V, United Kingdom – 230 V, United States – 120 V

There is slight difference in voltage in each country due to the many factors like demand. At this time there are countries that were using 220 V that are converting to the 230 V, which is the EU Standard.

When travelling and carrying appliances with you, it is essential to have a plug adapter and converter and know the voltage of the specific country that you are visiting.

## Example 2

Left-hand drive (LHD) and right-hand drive (RHD) vehicles.

Vehicles are usually manufactured in left-hand drive (LHD) and right-hand drive (RHD) configurations, referring to the placement of the driving seat and controls within the vehicle. Typically, the placement of the steering wheel is opposite to the rule of the road:

LHT countries use RHD vehicles, and RHT countries use LHD vehicles. Many countries permit both types of vehicles on their roads. Currently, China, the United States and the United Kingdom each have territories which differ from their primary traffic rule. In China, drivers drive on the right, while the special administrative regions of Hong Kong and Macau drive on the left.

#### Example 3

Electronic products; colour is another important factor when it comes to consumer products. When we think of the colour white, we think clean, sterile, minimalistic. However, in the Chinese market, the colour white is associated with death and people often dress in all white at funerals. Products that are marketed to Chinese with extensive use of white can be counter-productive to sales.

#### Example 4

McDonald's Corporation is the world's largest chain of hamburger fast food restaurants, serving around 68 million customers daily in 119 countries. In order to cater to local tastes and culinary traditions, and often in respect of particular laws or religious beliefs, McDonald's offers regionalized versions of its menu among and within different countries. As a result, products found in one country or region may not be found in McDonald's restaurants in other countries.

#### Example 5

Americans are just fine using two hands to type messages on their cell phones. We can see this with the prevalence of the BlackBerry smart phones. However, the Japanese like to text with only one hand. The Japanese spend a lot of their time on their subway system. One of their hands is always grabbing a hand rail overhead so that they don't fall over when the subway train is moving. Thus, they can only use one hand to send text messages or surf the Internet. This simple example shows why the Japanese prefer smaller clam shell phones with all the keys within thumb's reach.

#### Example 6

The Microsoft Xbox controller is slightly smaller for the Asian versions of the Xbox. Studies have shown that Americans have slightly larger average hand sizes than Asian gamers so Microsoft designed slightly larger controllers for the American market. Microsoft performed a human factors analysis for different markets and in the end, it paid off. [5]

AVAILABLE  
MARKS

## Quality of written communication

AVAILABLE  
MARKS

Level of response not worthy of credit.	[0]
Poor selection and use of a writing form and style appropriate to the content. The content is poorly organised and little use is made of appropriate technological vocabulary. The writing is barely legible and the spelling, grammar and punctuation are inaccurate.	[1]–[2]
Good selection and use of a writing form and style appropriate to the content. The content is organised and use is made of appropriate technological vocabulary. The writing is legible and the spelling, grammar and punctuation are accurate.	[3]
Very good selection and use of a writing form and style appropriate to the content. The content is well organised and good use is made of appropriate technological vocabulary. The writing is clearly legible and the spelling, grammar and punctuation are very accurate.	[4]

[4]

- (d) (i) Any **three** main differences between the main characteristics of introduction and the main characteristics of growth from the following:
- Sales are slow at the introduction stage compared to a significant increase at the growth stage
  - Very little profit at the introduction stage but profit increases at the growth stage
  - Marketing strategy will be different and costs will be higher at the introductory stage compared to the growth stage
  - There is little or no competition in the market at the introductory stage but by the growth stage competition increases with new companies entering the market.
- [3]
- (ii) Any **three** main differences between the main characteristics of maturity and the main characteristics of decline from the following:
- At the maturity stage product sales peak as market saturation is reached but at the decline stage sales reduce
  - At the mature stage production volumes increase and in effect costs are lowered but in the decline stage costs become counter-optimal
  - At the mature stage persuasive advertising is used to maintain market share but at the decline stage no marketing activity takes place
  - There are better profit margins at the mature stage than at the decline stage.
- [3]
- (e) (i) Any **two** main advantages associated with the use of sales promotion from the following:
- Sales promotions bring about a quick increase in sales figures
  - They are quickly recognised and accepted in the market
  - Sales promotions entice buyers to continue purchasing.
- [2]
- The **one** main disadvantage associated with the use of sales promotion is that:
- Each sales promotion must be carefully priced. Failure to do so could result in reducing market share.
- [1]

- (ii) Any **two** main advantages associated with the use of trade fairs compared to personal selling from the following:
- Access to a large number of potential buyers at one time and in one place
  - Excellent opportunity for making new contacts and renewing old ones which does not happen with personal selling
  - One can learn more about the market, products, trends and product competition at trade fairs.
- [2]

Any **one** main disadvantage associated with the use of trade fairs compared to personal selling from the following:

- Very expensive
  - Very competitive
- [1]

- (f) (i) The height of the garage door must be a minimum of 2.2 metres in order to provide clearance for the car with the fitted roof storage unit.

Level of response not worthy of credit.	[0]
The graphical information conveys that the garage door must be a minimum of 2.2 metres in order to provide clearance for the car with the fitted roof storage unit.	[1]

- The storage unit is designed with a maximum weight restriction of 60 kg with a recommendation of 50% of the weight in the middle, 25% on the front rail and the remaining 25% on the back rail.

Level of response not worthy of credit.	[0]
Limited graphical information which conveys that the storage unit is designed with a maximum weight restriction of 60 kg with a recommendation of 50% of the weight in the middle, 25% on the front rail and the remaining 25% on the back rail	[1]
Good quality graphical information which clearly conveys that the storage unit is designed with a maximum weight restriction of 60 kg with a recommendation of 50% of the weight in the middle, 25% on the front rail and the remaining 25% on the back rail	[2]

- The storage unit should be centred on the length and width of the roof.

Level of response not worthy of credit.	[0]
Limited graphical information which conveys that the storage unit should be centred on the length and width of the roof.	[1]
Good quality graphical information which clearly conveys that the storage unit should be centred on the length and width of the roof.	[2]

[5]

AVAILABLE  
MARKS

- (ii) An appropriate design which will allow the user to quickly secure different sized items in place. Show how your design could be attached to the housing of the storage unit.

Level of response not worthy of credit.	[0]
Poor sketches with little or no annotation. Difficulties in deciding if the design is suitable and will quickly secure different sized items. Little or no information on how the design is attached to the housing.	[1]–[2]
Annotated sketches are limited. The design and attachment to the housing is suitable and can allow the user to secure different sized items.	[3]
Detailed annotated sketches. The design and attachment to the housing is suitable and allows the user to quickly secure different sized items in place.	[4]–[5]

[5]

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- 6 (a) Any **two** main different causes of increased levels of greenhouse gases which have resulted from human activity from the following:
- Burning of fossil fuels
  - Deforestation
  - Poor choices when designing and manufacturing. [2]
- (b) Any **two** main characteristics associated with product research from the following:
- Carried out in order to examine and analyse existing competitor products within the market
  - Product research could assess the product's acceptance in the market
  - Product research could determine customer preferences
  - Product research could carry out packaging trials. [2]
- Any **two** main characteristics associated with distribution research from the following:
- This is research carried out by a business or company to analyse distribution methods for their product
  - A company will identify the most efficient, quick and reliable means of transport for distributing their product
  - Consumers, companies and retailers would be asked for their previous experience with certain distribution methods to evaluate the options. [2]
- (c) (i) Market development involves – finding new markets for existing products and concentrates on dealing with new customers and markets.
- The management of the company might consider the team's views as risky because there is no prior knowledge of the markets. [2]
- (ii) Product development involves – developing existing products further and concentrates on the innovation of existing products.
- Any **one** main reason why management may look positively on the team's views from the following:
- This is a relatively low risk option
  - Provides a greater range of products
  - It can be used to differentiate products from competitors in competitive markets. [2]
- (d) (i) Perceived value pricing method involves finding out from potential customers what they would be willing to pay for a product. The business then sets the price of the product on what they think the maximum price is that a consumer will pay. [2]
- (ii) The two main problems associated with the cost-plus pricing method which may influence the decision of the company are:
- It does not take the demand of the product into account
  - The business has no way of knowing if the potential customers will pay the calculated price. [2]

AVAILABLE  
MARKS

(e) One main quality assurance process that could be used, e.g.:

(i) This may include setting quality objectives, defining tests and verification activities, process evaluation, defining the individual responsibility of the team members, identifying training requirements, budgeting and funding for quality control jobs, scheduling all activities, documenting and tracking. [2]

(ii) This could benefit the company by – ensuring that the quality of the product is right first time and every time. In addition with a Quality Assurance process in place the retailer/consumer will have more confidence in the product. This may help improve sales. [2]

(f) Explanation of how designers have specifically managed to reduce material use.

Example 1.

Smart car. Components have been re-evaluated and redesigned to minimise material use and components have been designed to be multifunctional which also reduced material use. [2]

Example 2.

Dyson products – hoover/airblade. Engineers working for Dyson aim to do more with less – creating machines which perform better than their predecessors using fewer raw materials. New technology, such as the Dyson digital motor, which is a third of the size of a conventional brushed motor – helps reduce the size of the machines and ultimately the use of materials. [2]

(g) (i) **One** example of a product which incorporates social factors in its design.

Social factors are things that affect lifestyle,  
e.g. the bicycle.

Bicycles have been designed to cater for different lifestyles. Racing, off road, touring and mountain biking are just a few examples of how the designer has incorporated social factors in its design. [2]

(ii) **One** example of a product which incorporates economic factors in its design.

e.g. cars – The design of cars within a specific make and model can demonstrate consideration given to economic factors with the various options (engine size, interior finish, central locking and a range of accessory packs) available. [2]

(h) Any **two** main characteristics associated with the influence of the work of Dyson from the following:

- Focused on form, function, ergonomics and aesthetics in order to develop consumer products
- Emphasised the importance of prototyping with over 5000 prototypes for the world's first bagless vacuum cleaner
- Adopted technologies from other disciplines to incorporate into new products
- Created a design foundation with a major focus on design education.

[4]

AVAILABLE  
MARKS

- (i) (i) A suitable low cost floor protector.

Level of response not worthy of credit.	[0]
Poor sketches with little or no annotation. Difficulties in deciding if the design is suitable, low cost and can be quickly secured to the corner edge of the desk.	[1]–[2]
Annotated sketches are limited. The design is suitable and some consideration is given to cost and the ability of it to be quickly and securely fitted to the corner edge of the desk.	[3]
Detailed annotated sketches. The design is suitable, low cost and can be quickly and securely fitted to the corner edge of the desk.	[4]–[5]

[5]

- (ii) • Low cost adequate support with aesthetic appeal with minimal use of materials.

Level of response not worthy of credit.	[0]
Poor sketches with little or no annotation. Difficulties in deciding if the design is suitable, low cost, aesthetically pleasing with the minimal use of materials.	[1]
Annotated sketches are limited. The design is suitable and some consideration is given to cost, aesthetics and minimising the use of materials.	[2]
Detailed annotated sketches. The design is suitable, low cost, aesthetically pleasing with the minimal use of materials.	[3]

[3]

- Explain how your redesign would be appropriate for batch production.

Level of response not worthy of credit.	[0]
Limited explanation of how the design facilitates batch production.	[1]
Clear explanation of how the design facilitates batch production.	[2]

[2]

**Section C****Total****AVAILABLE  
MARKS**

40

**80****80**

SAMPLE ANSWER: 2 GROUPS  
X+A+W- / W+ A- B+ B- X-

ANSWER 4 (C)

