

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper
for the guidance of teachers

0445 DESIGN AND TECHNOLOGY

0445/42

Paper 4 (Systems and Control), maximum raw mark 50

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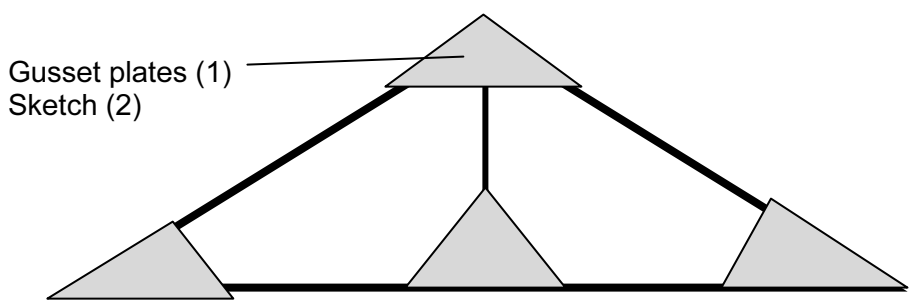
Section A

Answer **all** questions from this section.

1

Force	Type of force	Example
Tension	Stretching [1]	Cable on a suspension bridge
Compression	Squashing or crushing	Column in building [1]
Torsion [1]	Twisting	Drive shaft in engine [1]

2

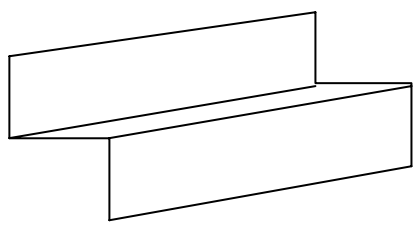


Gusset plates (1)
Sketch (2)

[3]

3

Folds increase rigidity (1)
Sketch (2)



[3]

4

Source	Energy conversion	Example of use
Dry cell battery	Chemical to electrical [1]	Portable radio [1]
Solar cell	Light into electrical	Solar powered calculator [1]
Dynamo	Mechanical to electrical [1]	Bicycle lamp

5

Transistor

[1]

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6 The reed contacts are brought together by a magnet (1) passing by them which completes the circuit (1)

7 e.g. Washing machine control [1]

8

Type of motion	Description	Example of use
Linear	Moving in a straight line	Lift doors [1]
Rotary	Moving in a circular path [1]	Drilling machine
Reciprocating [1]	Moving back and forth in a straight line	Jig saw blade
Oscillating	Swinging back and forth in an arc	Pendulum [1]

9 (a) Third [1]

(b) e.g. Tongs [1]

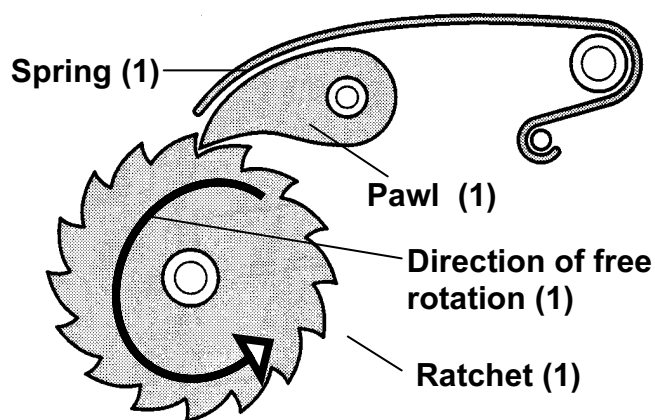
10 e.g. Printer head [1]

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Section B

Answer **one** question from this section.

11 (a) (i)



[4]

(ii) e.g. Winch; fishing reel

[1]

(iii) Disengage the pawl (1) by pushing it out sideways (1).

[2]

(b) Rotary (1) to linear (1)

[2]

(c) There is no slip (1) due to the positive engagement of the chain and sprocket wheel (1)

[2]

(d) (i) $VR = \text{Teeth on driven} / \text{Teeth on driver}$ (1)

$$VR = 36 / 18 \text{ (1)}$$

$$VR = 2 \text{ (1)}$$

[3]

(ii) $\text{Speed of driver} / \text{speed of driven} = VR$ (1)

$$\text{Speed of driver} / VR = \text{speed of driven}$$

$$200 / 2 = \text{speed of driven} = 100 \text{ rpm (1)}$$

[2]

(iii) $MA = VR \times \text{Efficiency}$ (1)

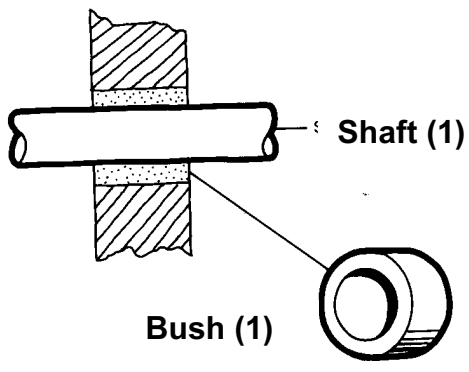
$$MA = 2 \times 60 / 100 \text{ (1)}$$

$$MA = 1.2 \text{ (1)}$$

[3]

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(e) (i)



Quality of diagram (1)

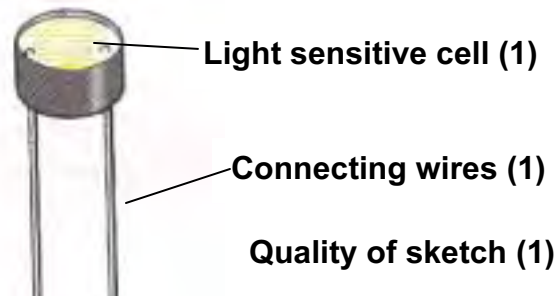
- (ii) Bicycle: pram wheel [1]
- (iii) Metal to metal contact is reduced (1) by introducing a layer of lubricant (1) [2]

12 (a)

Transducer	Environmental change sensed	Example of use
LDR	Light [1]	Burglar alarm [1]
Thermistor [1]	Temperature	Frost alarm
Strain gauge	Length of a structural member	Measure strain in a joist [1]

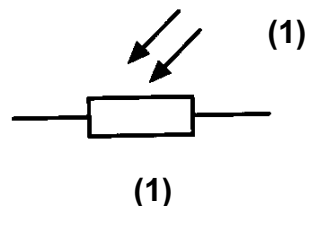
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(b) (i)



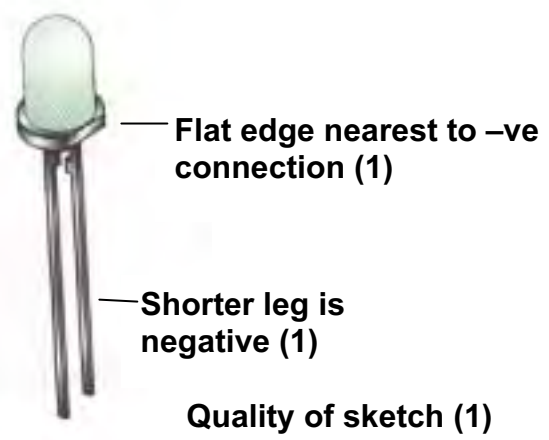
[3]

(ii)



[2]

(c) (i) Sketch and label an LED component to show the positive and negative connections and how these connections are identifiable.



[3]

(ii) An LED must be protected (1) from excessive current (1) [2]

(iii) On / off indicator lamp on electrical appliance. [1]

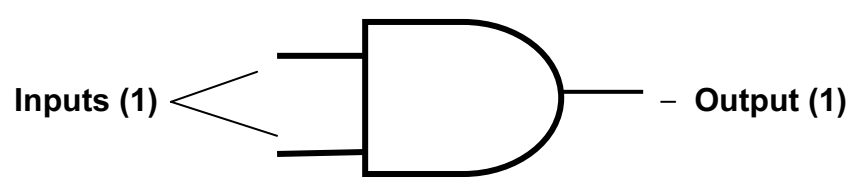
(d) (i) $V = I.R$
 $9 = .02 \cdot R$ (1)
 $R = 9 / .02$ (1)
 $R = 450 \Omega$ (1) [3]

(ii) 1st: Yellow [1]
 2nd: Violet (allow Green) [1]
 3rd: Brown [1]

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(e) (i) AND

(ii)



Shape (1)

[3]

13

Number	Name
1	Strut
2	Tie
3	Cantilever
4	(Simply supported) beam

[4]

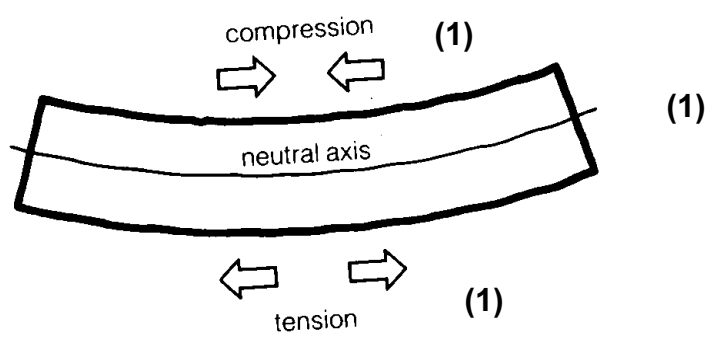
(b) Increases the rigidity (1) and limits the tendency to buckle (1).

[2]

(c) (i) It is a rigid section that supports the load (1) but is lightweight (1).

[2]

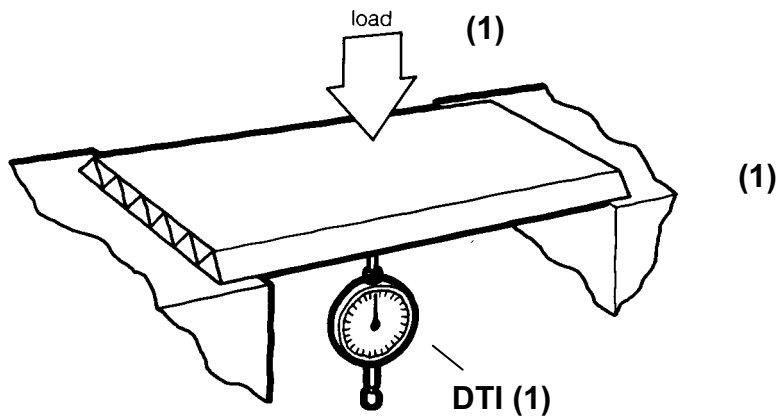
(ii)



[3]

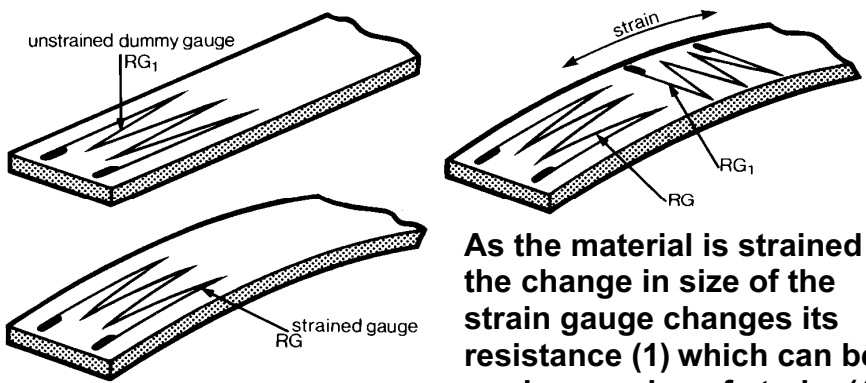
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(d)



[3]

(e)



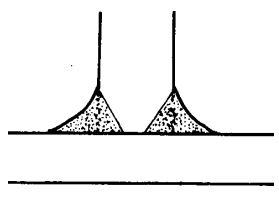
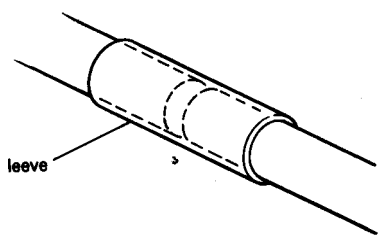
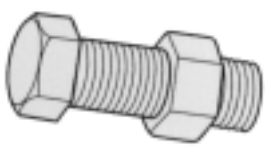
As the material is strained the change in size of the strain gauge changes its resistance (1) which can be read as a value of strain. (1)

Diagram (1)

[3]

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(f) (i)

Joining method	Diagram	Use
Welding		Framework for a building. [1]
Sleeving		Joining tent poles.
Nuts and bolts		'Dexion' shelving [1]

(ii) To distribute the load (1) over a wider area (1) thus reducing the stress on the component (1). [3]