

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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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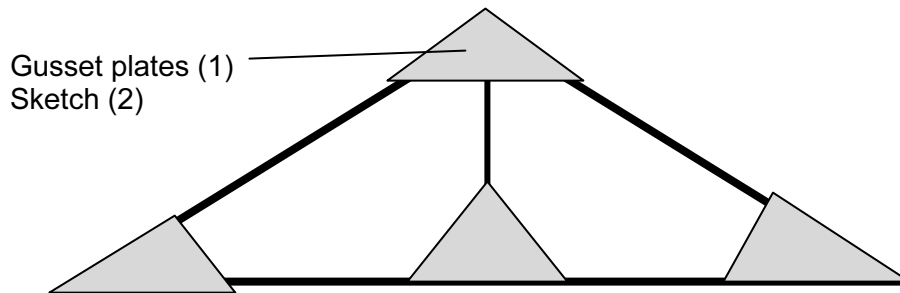
Section A

Answer **all** questions from this section.

1

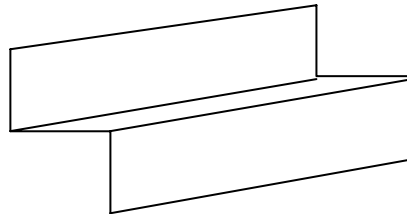
Force	Type of force	Example
Tension	Stretching [1]	Cable on a suspension bridge
Compression	Squashing or crushing	Column in building [1]
Torsion [1]	Twisting	Drive shaft in engine [1]

2



[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) [2]

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]

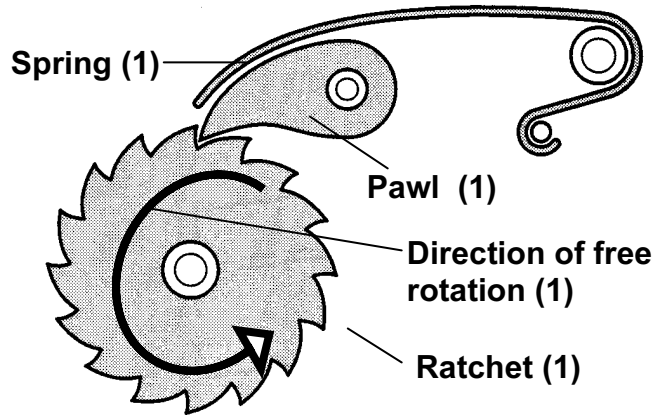
10 e.g. Printer head [1]

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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)

$$VR = 36 / 18$$

$$VR = 2$$

[3]

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

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

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

[2]

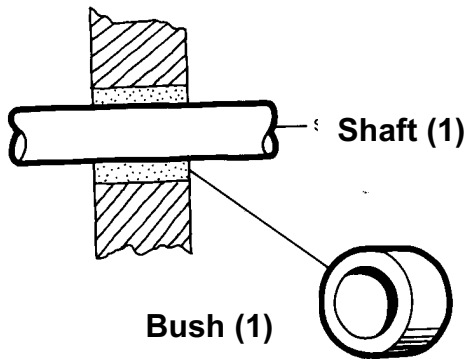
(iii) $MA = VR \times \text{Efficiency}$ (1)

$$MA = 2 \times 60 / 100$$

$$MA = 1.2$$

[3]

(e) (i)



Quality of diagram (1)

[3]

(ii) Bicycle: pram wheel

[1]

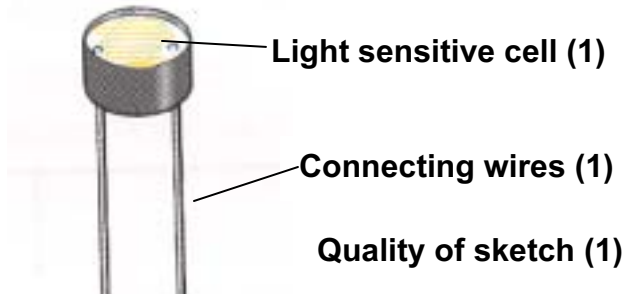
(iii) Metal to metal contact is reduced (1) by introducing a layer of lubricant (1)

[2]

12 (a)

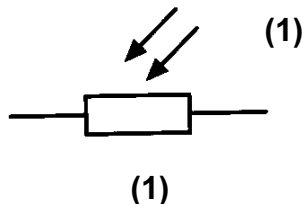
Transducer	Environmental change sensed	Example of use
LDR	Light [1]	Burglar alarm [1]
Thermistor [1]	Temperature	Frost alarm
Strain gauge	Length of a structural member	Measure strain in a joist [1]

(b) (i)



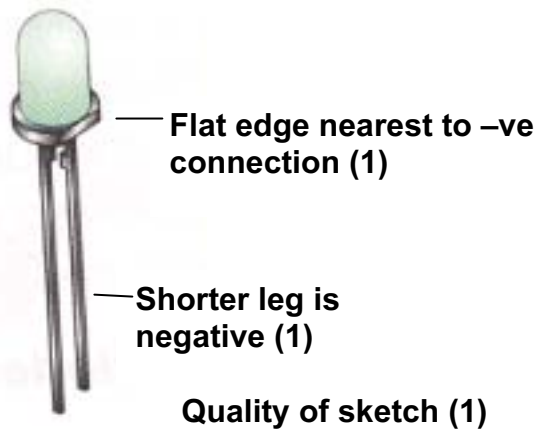
[3]

(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
 2nd: Violet (allow Green)
 3rd: Brown

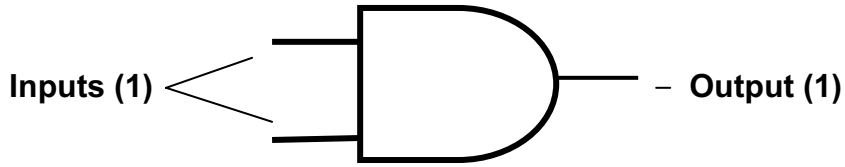
[1]

[1]

[1]

(e) (i) AND [1]

(ii)



Shape (1)

[3]

13

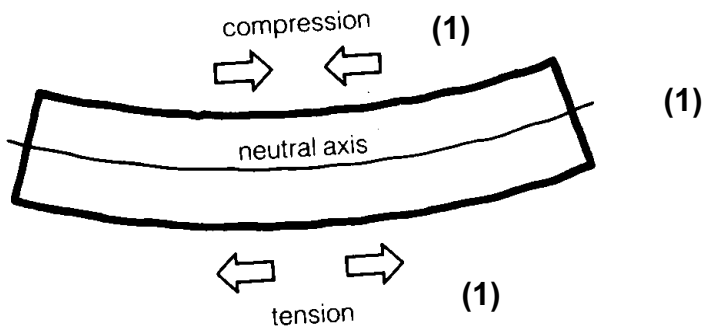
Number	Name
1	Strut
2	Tie
3	Cantilever
4	(Simply supported) beam

[4]

(b) Increases the rigidity (1) and limits the tendency to buckle (1). [2]

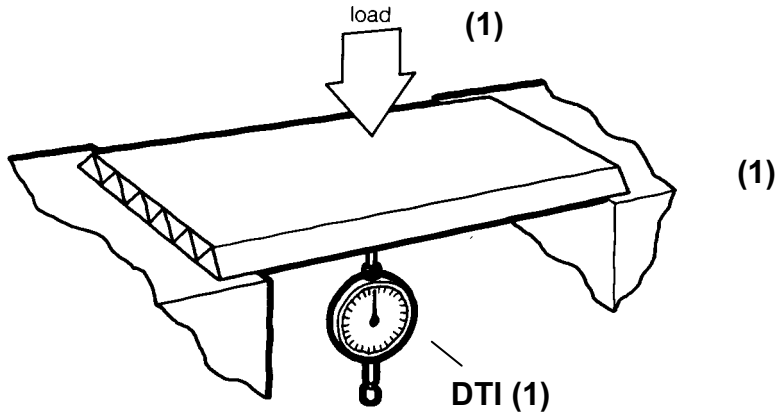
(c) (i) It is a rigid section that supports the load (1) but is lightweight (1). [2]

(ii)



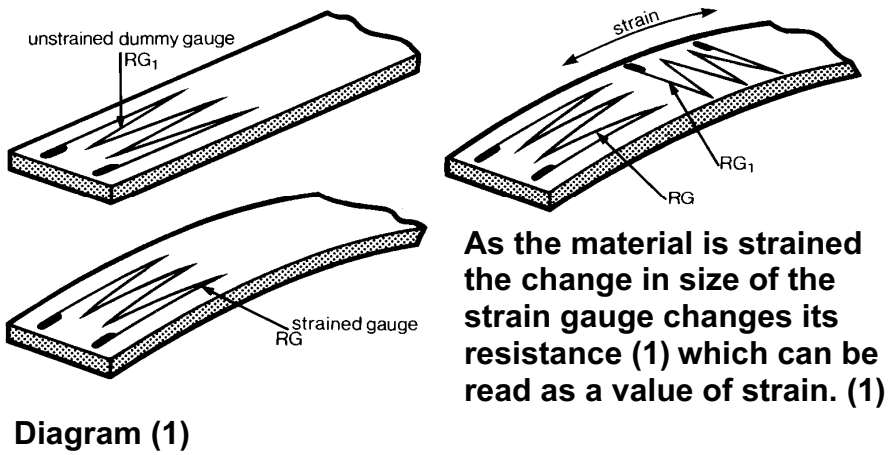
[3]

(d)



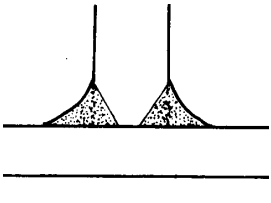
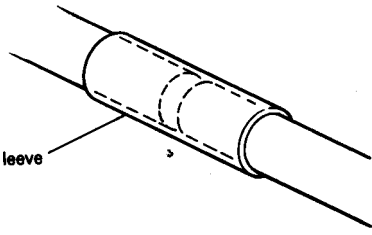
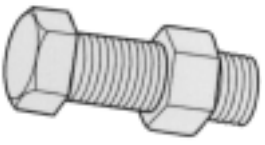
[3]

(e)



[3]

(f) (i)

Joining method	Diagram	Use
Welding	 <p>[2]</p>	Framework for a building. [1]
Sleeving	<p>[1]</p>  <p>leave</p>	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]