UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

0445 DESIGN AND TECHNOLOGY

0445/43 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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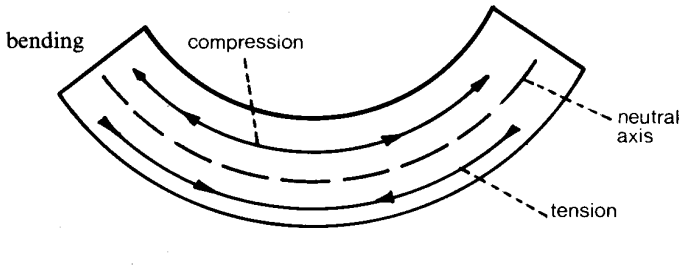
UNIVERSITY of CAMBRIDGE
International Examinations

Section A

1 Rib, Web [1]

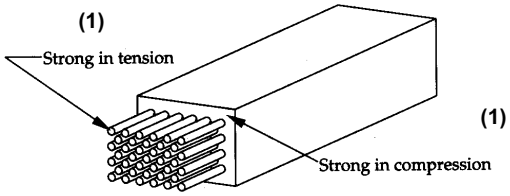
2 **Strut:** Horizontal member [1]
Tie: Diagonal member [1]

3



[3]

4



[2]

5 Robustness; size; longevity; colour [2]

6 **(a)** Electrolytic cap. (1) Must be connected according to its polarity. (1) Ceramic cap. Can be connected any way round. (1) [3]

(b) To adjust (1) the frequency (1) of the speaker tone. [2]

(c) Six [1]

7 **(a)** Snail Cam [1]

(b) Rotary (1) to Reciprocating (1) / Linear (1) [2]

8 **Pivot A** Fixed (1)
Pivot B Moving (1) [2]

9 **(a)** CAD; Construction kits; card / paper fasteners [1]

(b) Save costs on materials / time / testing / fault finding [1]

10 **C:** 2μF ; 20 μF ; 200μF

R: 10MΩ : 1MΩ : 100kΩ [2]

Section B

Each question worth 25 marks.

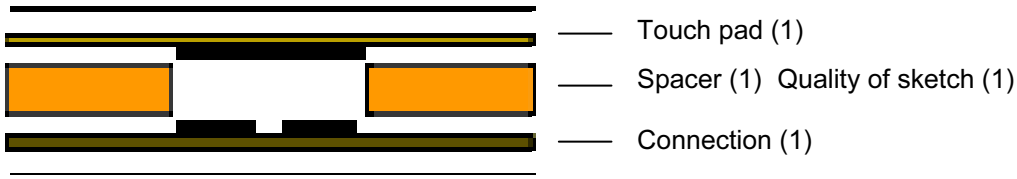
11 (a) (i) LDR [1]

(ii) Adjust circuit sensitivity [1]

(iii) Protect (1) the TR1 from back emf (1) [2]

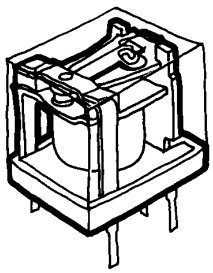
(b) (i) Temperature: Thermistor (1) Sketch (2)
Moisture: Probes or pad. (1) Sketch (2) [6]

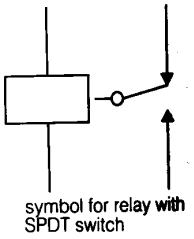
(ii)



[4]

(iii) Relay (1)





Accept the symbol also.
Main features visible:

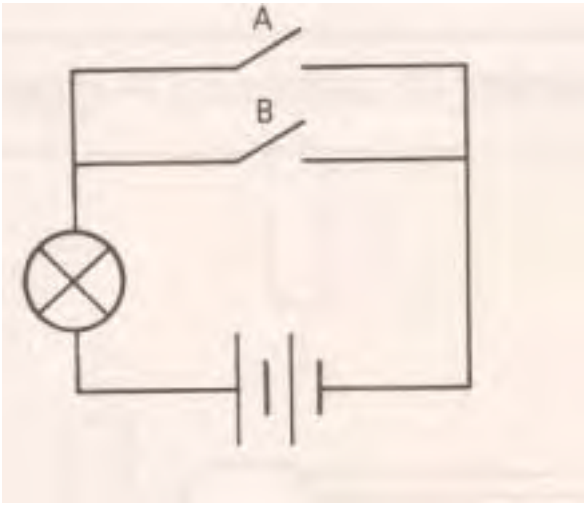
- Contacts, (1)
- Switch, (1)
- Coil. (1)

Maximum mark allowed [3]

[3]

(c) Addition of second transistor (1) to create a Darlington Pair (1) [2]

(d) (i)



A = Membrane switch (1)

B = Light beam (1)

Circuit (1)

[3]

(ii)

Input A	Input B	Output
0	0	0
0	1	1
1	0	1

[3]

12 (a) Rotary motion (1) in one plane is converted to rotary motion (1) at 90˚ (1) [3]

(b) (i) Bevel [1]

(ii) To ensure that the output motion (1) is smooth (1) [2]

(iii) Increased VR (1) means that the output speed is far greater than the input speed (1). [2]

(c) This increases the MA (1) of the device, thus means the user needs to expend less effort (1) for a greater output force (1). [3]

(d) (i) Gear ratio = Driver to driven (1) 60 : 12 (1) 5 : 1 (1) [3]

(ii) 60 rpm x 5 = Output speed x 1 (1)
Thus Output speed = 300 rpm (1)
Units (1) [3]

(e) (i)

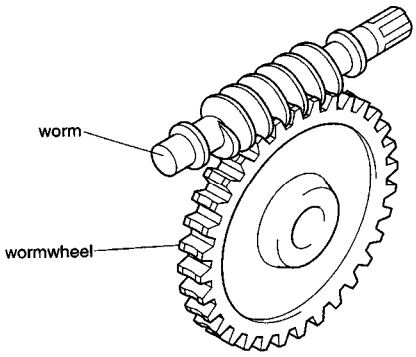
Worm (1)

Wormwheel (1)

Worm direction (1)

Wheel direction (1)

Quality of sketch (1)



[5]

(ii) The VR of the system is large (1) as the worm (driven gear) has effectively one tooth (1). [2]

(iii) Guitar tuner [1]

13 (a) ACW Moments = CW Moments (1)
Thus CxY = XxL (1)
C = XxL / Y (1) [3]

(b) (i) Tension [1]

(ii) Torsion [1]

(iii) Sketch showing two holes for cables (2)
Quality of response (1) [3]

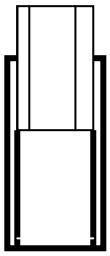
(iv) To ensure that the unit is balanced (1) and that loads are evenly distributed (1) also ensures that the hole in the beam is not too near an edge and could tear through (1). [3]

(v) The beam will stretch under applied load (1) but will return to its original shape and size when the load is taken off (1) without any permanent deformation (1). [3]

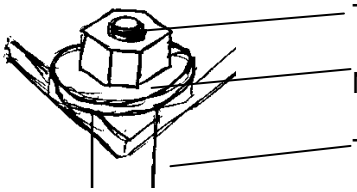
(vi) Shear [1]

(c) Helps to distribute the forces evenly (1) across a wider area thus decreasing stress (1). [2]

(d)



OR



Threaded bar fixed into the tube (1)

Nut and washer (1)

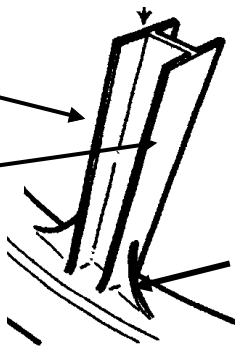
Tubing (1)

Quality of sketch / description (1)

[4]

(e) (i)

(1)



The forces are concentrated at the outer edges of the beam (1) thus this is where the largest amount of material needs to be located. (1)

[3]

(ii) Joists in a building structure. [1]