UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2008 question paper

0445 DESIGN AND TECHNOLOGY

0445/04 Paper 4 (Systems and Control), maximum raw mark 50

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Section A

Answer **all** questions in this section.

1 Tension / tensile force / stretching [1]

2 **(a)** LDR / Light dependant resistor / Phototransistor [1]

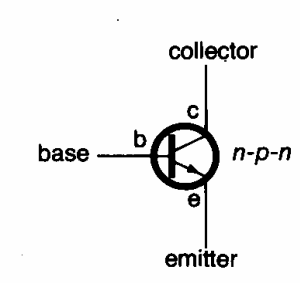
(b) Burglar alarms, Counters [1]

3

Motor	**Eccentric cam**	**Follower**
Rotary	**Rotary**	**Reciprocating**

[3]

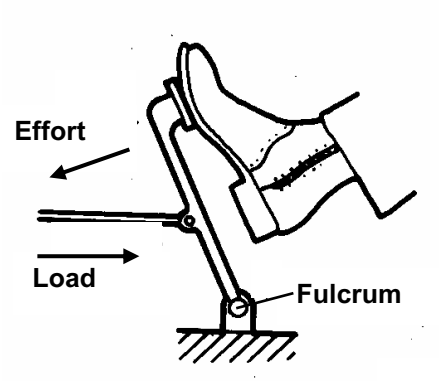
4



[3]

5 **(a)** 2nd [1]

(b)



[3]

6 Movement energy is called **KINETIC** energy. [1]

7 **(a)** 1 Friction / Heat energy
2 Badly made / inaccurately fitted components [2]

(b) **(i)** 1 Lubrication or low friction materials
2 Greater accuracy in manufacturing [2]

(ii) Details given 2 x (1)
Sketch (1) [3]

8 R = 100kΩ

9 Washing machine control / alarm systems [1]

10 To take into account (1) unforeseen extra loading (1) [2]

[Total: 25]

Section B

11 **(a)** Depressing the switch turns on the 555 (1) / this allows current to flow through the RC circuit (1) which keeps the LED on (1) for the specified time period (1). [4]

(b) This is a current limiting resistor (1) / that protects the LED (1) [2]

(c) This would mean that the LED would be on (1) until the switch was depressed (1) then it would go off for the specified time period (1) [3]

(d) If wrongly connected the capacitor would blow. [1]

(e) T = 1.1 x R (ohms) x C (F) (1)
T = 1.1 x 100,000 x 100 / 1000,000 (1)
T = 1.1 x 10 (1)
T = 11 seconds (1) [4]

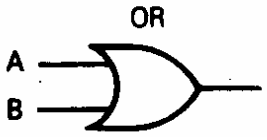
(f) **(i)** PTM (Push to make) [1]

(g) A battery is a collection of cells which add up to the required voltage. [2]

(h) **(i)** **Or** gate [1]

NO CARRY FORWARD ERROR

(ii)



[3]

(iii) Parallel [1]

(iv) Complete the truth table below for this logic circuit.

Input A	Input B	Output
0	0	0 (1)
0	1	1
1 (1)	0 (1)	1

[3]

[Total: 25]

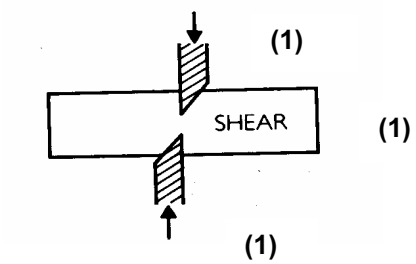
12 (a) The ratio between the effort distance and the load distance from the pivot (1) makes it easier for the operator (1) to crush the can [2]

(b) For equilibrium RR = RL
1000mm x 100N = 300mm x F (1)
1000 / 300 x 100N = F (1)
F = 333.33 N (1) [3]

(c) (i) Shear [1]

(ii) Pins in the linkage to the pressure plate [1]

(iii)



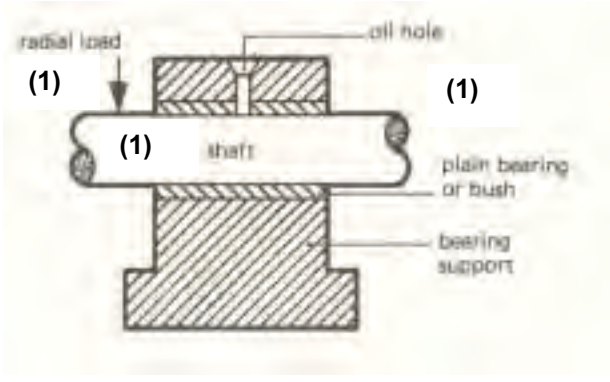
[3]

(d) Reduce the length of A to B / make handle longer [1]

(e) (i) 2nd [1]

(f) (i) Reduce friction (1) make operation smoother (1)
Reduce wear and tear (1) [2]

(ii)



[3]

(g)

Bearing	Diagram	Use & Example
Ball (1)		Bicycle
Roller		Heavy loading. Vehicles. Printing press. (1)

(h) Lubrication is also needed in mechanical systems.

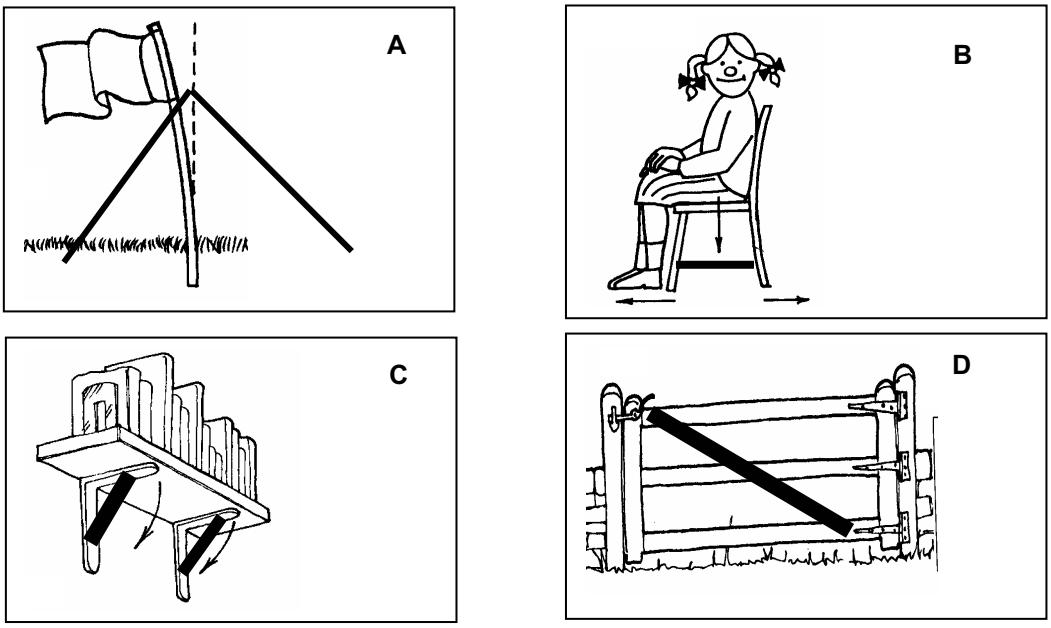
(i) Smooth running / reduce friction / reduce wear and tear increase machinery lifespan / cooling / increase efficiency [2]

(ii) **Type 1:** Oil (1)
Example: Motor car engine (1) [2]

Type 2: Grease (1)
Example: Wheel bearings (1) [2]

[Total: 25]

13 (a)

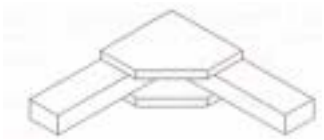
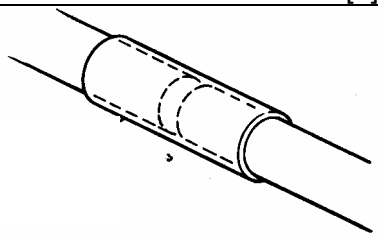
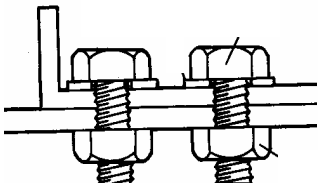


[4]

(b) Dynamic loads are moving loads (1) they create greater moment of force acting (1).

(c) This allows for forces that are not normally present (1) and example would be the force severe weather acting on a bridge (1) whereas in a chair the unforeseen forces are lesser (1) [3]

(d)

Joining method	Diagram	Use
Gusset plate	 [2]	**Roof trusses** [1]
Sleeving [1]		Joining tent poles.
Nut and bolt		**Joining temporary frame works** [1]

(e) (i)

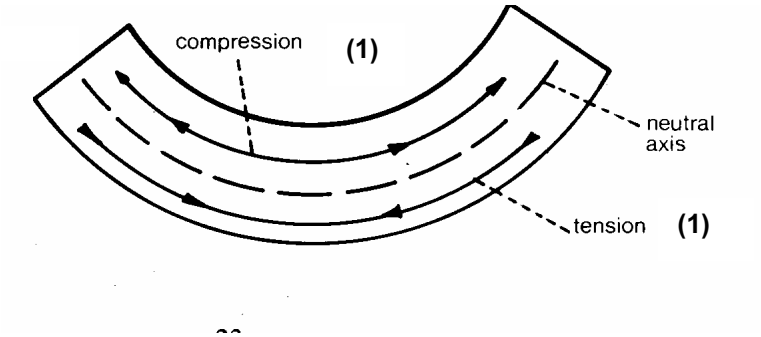
Layers (1)

Grains (1)

[2]

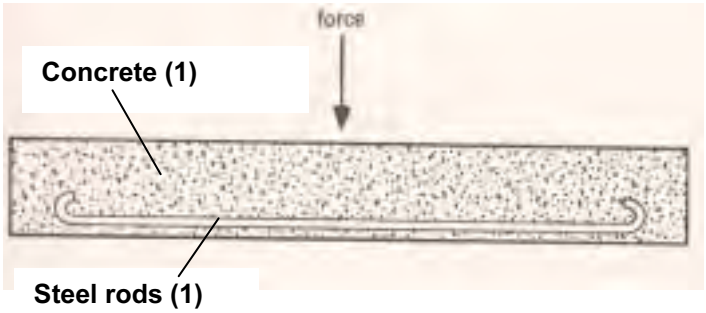
(ii) Alternating the wood grain (1) creates strength in all directions (1). [2]

(f) (i)



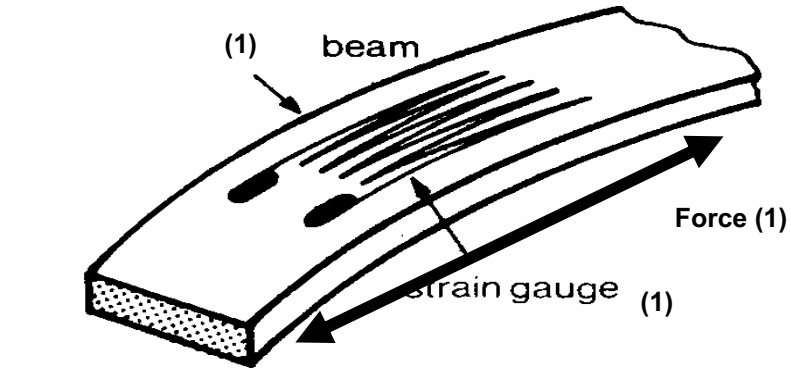
[2]

(ii)



[2]

(iii)



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[Total: 25]