

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.

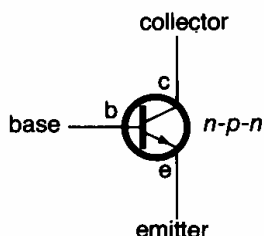
1 Tension / tensile force / stretching [1]

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

(b) Burglar alarms, Counters [1]

3 Motor Eccentric cam Follower
Rotary Rotary Reciprocating [3]

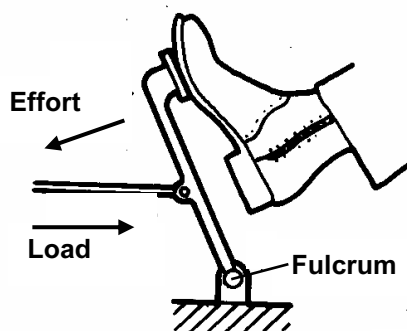
4



[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]

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- 8 R = 100kΩ [1]
- 9 Washing machine control / alarm systems [1]
- 10 To take into account (1) unforeseen extra loading (1) [2]

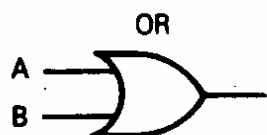
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Section B

- 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) $T = 1.1 \times R \text{ (ohms)} \times C \text{ (F)}$ (1)
 $T = 1.1 \times 100,000 \times 100 / 1,000,000$ (1)
 $T = 1.1 \times 10$ (1)
 $T = 11 \text{ seconds}$ (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]

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(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]

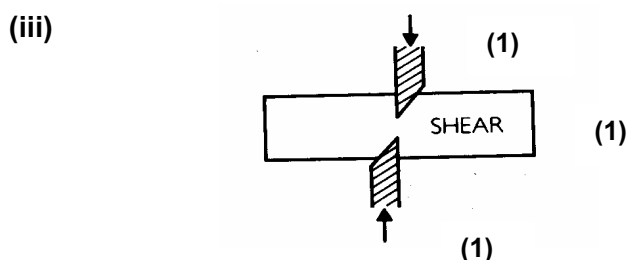
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12 (a) The ratio between the effort distance and the load distance from the pivot (1) makes it easier for the operator (1) to crush the can [2]

(b) For equilibrium $RR = RL$
 $1000\text{mm} \times 100\text{N} = 300\text{mm} \times F$ (1)
 $1000 / 300 \times 100\text{N} = F$ (1)
 $F = 333.33\text{ N}$ (1) [3]

(c) (i) Shear [1]

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

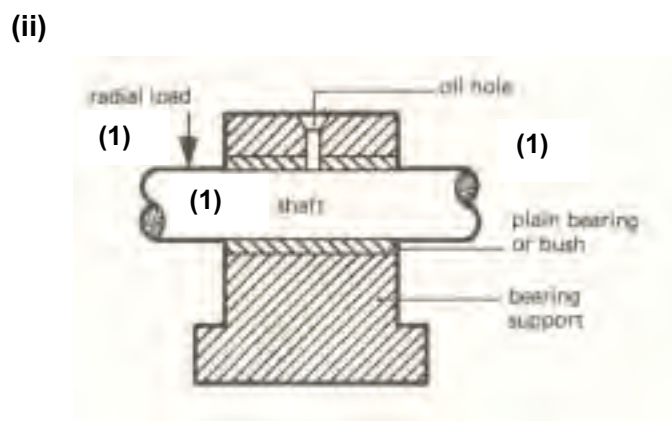


[3]

(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]



[3]

(g)

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

(h) Lubrication is also needed in mechanical systems.

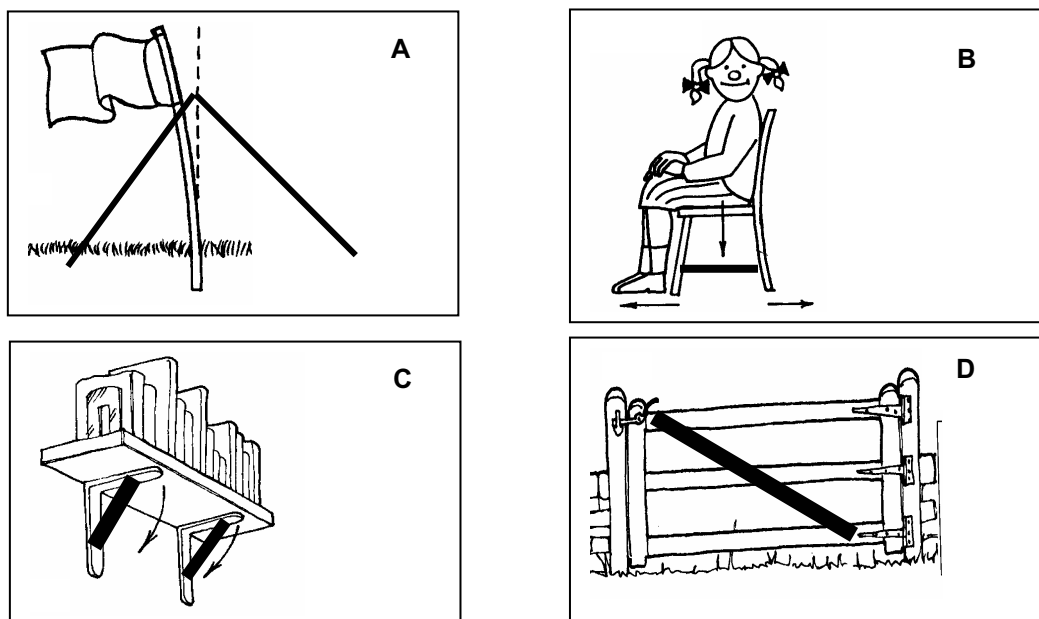
(i) Smooth running / reduce friction / reduce wear and tear increase machinery lifespan / cooling / increase efficiency [2]

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

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

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13 (a)



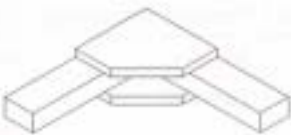
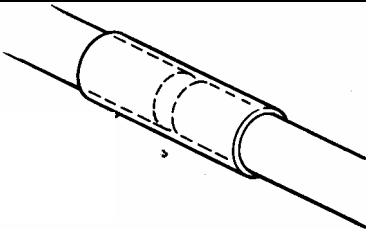
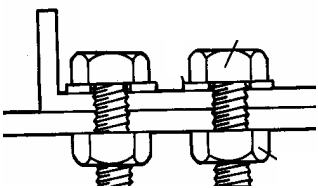
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(b) Dynamic loads are moving loads (1) they create greater moment of force acting (1). [2]

(c) This allows for forces that are not normally present (1) and example would be the force of 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)

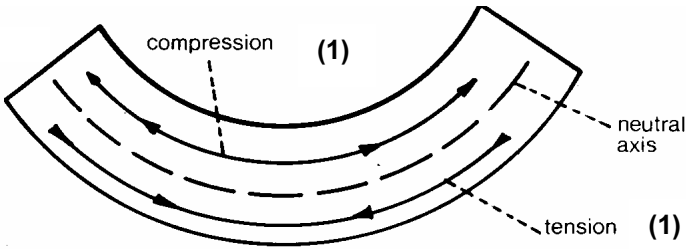
Grains (1)

[2]

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

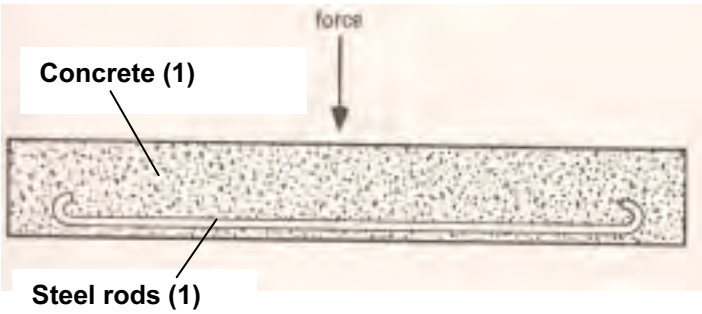
[2]

(f) (i)



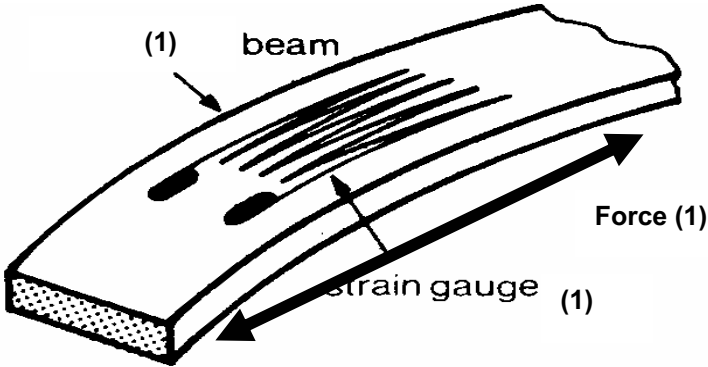
[2]

(ii)



[2]

(iii)



[3]

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