

MARK SCHEME for the October/November 2007 question paper

0445 DESIGN AND TECHNOLOGY

0445/04

Paper 4 (Technology), maximum raw mark 50

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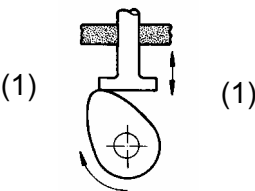
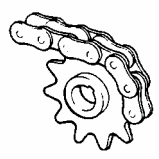
Section A

1 Tensile

2 Electrolytic (1) capacitor (1)
Time delay circuit (1)

[3]

3

| Name | Diagram | Use |
|--------------------------------------|---|----------------------|
| Pear cam and flat follower | (1)  (1) | Valve operation |
| Sprocket and Chain (Chain drive) (1) |  | Bicycle transmission |

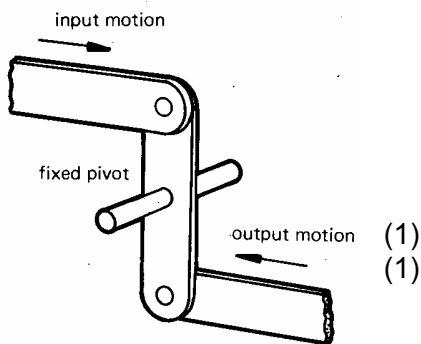
[3]

4 Second
An example: Wheelbarrow/Nutcrackers/Brake pedal

[1]

[1]

5 (a)



[2]

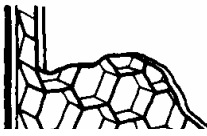
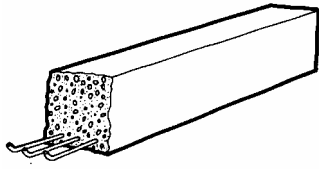
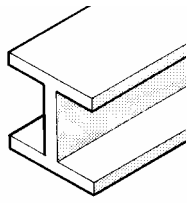
(b) Linear

[1]

(c) Change direction (1) without change of value (1)

[2]

6 Complete the table below:

| Name | Diagram | Use |
|-----------------------|---|----------------------------|
| Honeycomb cells |  | Door panel inner (1) |
| (Reinforced) beam (1) |  | Lintel (1) |
| 'I' Section beam |  | Steel framed buildings (1) |

7 NOT gate/Inverter [1]

8 (a) Sense change in light level (1)
 (b) Burglar alarm (1) [2]

9 Deflection of a aircraft wing (1) [1]

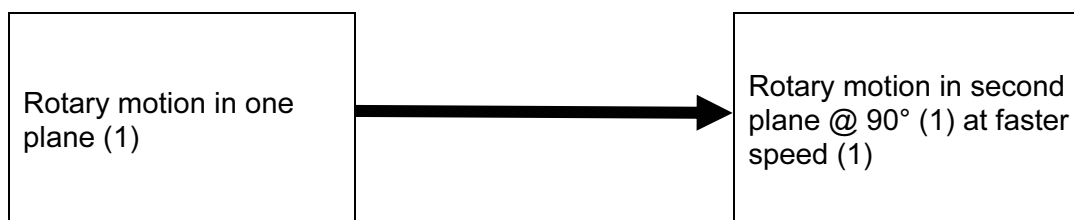
10 Gusset plate (1) Braces (1) [2]

[Total Section A: 25]

Section B

Answer **one** question from this section.

11 (a)

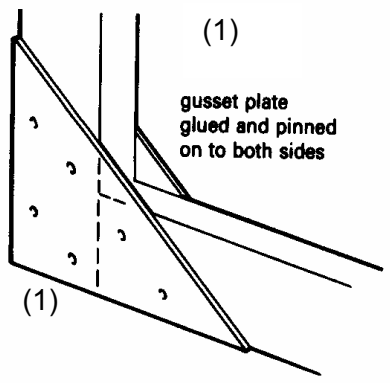


[Max 2]

- (b) (i) Bevel [1]
- (ii) Gives greater VR (1) and increases the speed of the drill chuck (1) [2]
- (iii) Keeps the driver wheel level (1) & makes the motion smoother (1) [2]
- (c) Greater MA (2) thus makes turning the drill bit easier (1) [3]
- (d) (i) Driver to driven (1)
60 : 12 (1)
5 : 1 (1) [3]
- (ii) 60 rpm × 5 = output speed (1)
300 rpm = Output speed (1)
Units (1) [3]
- (e) (i) Positive drive system (1)/where there is little slip (1) [1]
- (ii) Over time the belt will stretch and lose its elasticity (1) thus efficiency will suffer (1) [2]
- (iii) Timing belt/plotter drive [1]
- (iv) VR is the ratio (1) of the number of teeth on the driven wheel (1) to the number of teeth on the driver wheel (1) [3]
- (f) Flat (1) Record player turntable (1)
Vee (1) Drilling machine pulley system (1)
Round (1) Mecanno toy pulley belt (1) [2]

| | | |
|--------|-------------------------------|----------|
| Page 5 | Mark Scheme | Syllabus |
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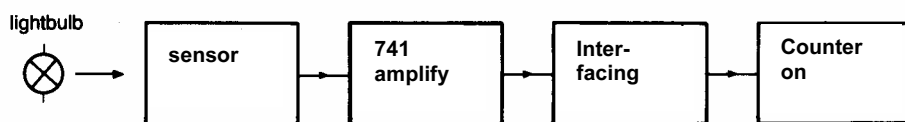
- 12 (a) (i) Crane/bridge/pylons/building framework
- (ii) Tanker/car bodies/aircraft fuselage
- (b) Frame has members (1) which distribute the forces shell distributes the forces through the skin of the shell (1) [2]
- (c) 1 Support: Carries its own mass (1) and any applied load (1) [2]
- 2 Span: Bridges a gap (1) carrying a load over it (1) [2]
- 3 Contain: Holding a load (1) inside (1) [2]
- (d) A roof truss carries a static load of the mass of the tiles (1) but it also needs to withstand dynamic loads such as winds (1) or other moving forces such as work men (1) [3]
- (e) (i) Name the parts numbered 1 to 3. [1]
- 1 Column [1]
- 2 Beam [1]
- 3 Brace [1]
- (ii) Shows compressive forces (1) sketch (1) [2]
- (iii) Triangulation in structures promotes rigidity (1) it reduces the tendency to distort (1) [2]
- (iv)



[2]

- (f) A member that, if removed (1), has no effect (1) on the structure [3]
- Sketch (1)

13 (a)



[4]

(b) (i) Relay

[1]

(ii) Interfacing (1) between low current circuit (1) and higher current circuit (1)

[3]

(iii) Protection (1) for the transistor (1) from back emf (1)

[2]

(iv) Varies (1) the sensitivity (1) of the LDR and the triggering of the 741 (1)

[3]

(v) Sets voltage for the bulb

[1]

(c) The pair of resistors splits the voltage across pin 3 (1) and thus controls the gain of the 741 (1) this determines the triggering of the relay (1)

[3]

(d) By changing the position of LDR (1) and the 47kΩVR (1) the function is reversed (1)

[3]

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

| Pad P On/Off | Pad Q On/Off | Counter state On/Off |
|--------------|--------------|----------------------|
| Off | Off | Off |
| Off | On | OFF |
| On | Off | OFF |
| ON | ON | On |

[4]

(ii) **AND** circuit

[1]