MARK SCHEME for the October/November 2007 question paper

0445 DESIGN AND TECHNOLOGY

0445/04   Paper 4 (Technology), maximum raw mark 50
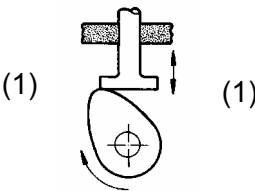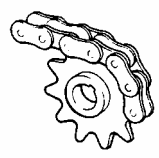
Section A

1 Tensile [1]

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 [1]
An example: Wheelbarrow/Nutcrackers/Brake pedal [1]

5 (a)

input motion

fixed pivot

output motion (1)
(1)
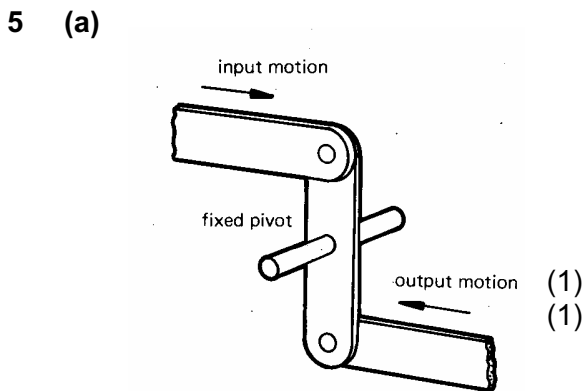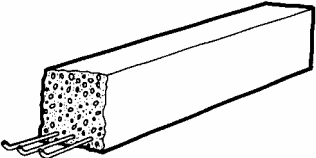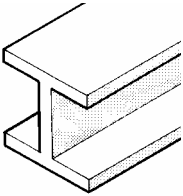
[2]

(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	(1)	Steel framed buildings

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)

Rotary motion in one plane (1)	Rotary motion in second plane @ 90° (1) at faster speed (1)

[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 = 0utput 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) Drillling machine pulley system (1)
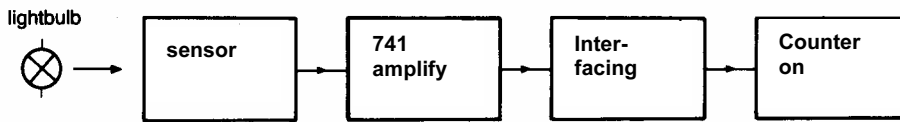Round (1) Mecanno toy pulley belt (1) [2]

12 (a) (i) Crane/bridge/pylons/building framework [1]

    (ii) Tanker/car bodies/aircraft fuselage [1]

(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   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)

(1)

gusset plate
glued and pinned
on to both sides

(1)

[2]
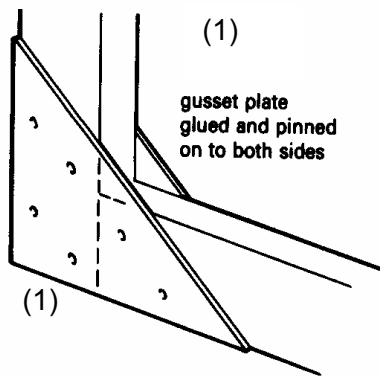
(f) A member that, if removed (1), has no effect (1) on the structure
Sketch (1) [3]

13 (a)

lightbulb

$\otimes \rightarrow$ | sensor | → | 741 amplify | → | Inter-facing | → | Counter on |

[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 slits 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]