Engineering Questions by Topic

Higher Level

Question 8

Mechanisms & Electronics

50 Marks

1996 Question 8

(a) Describe the principal function of any **three** of the following:

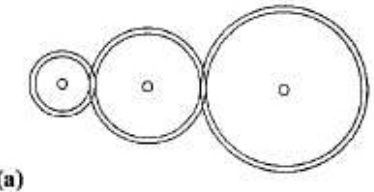
- **(i)** throttle valve;
- **(ii)** thermistor;
- **(iii)** heat pump;
- **(iv)** solar panel;
- **(v)** dividing head.

(b) Explain clearly the function of any **two** of the following:

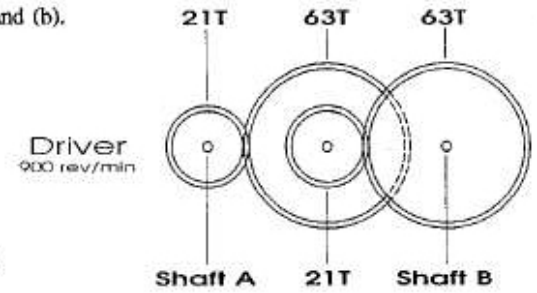
- **(i)** strain gauge;
- **(ii)** a non-return valve;
- **(iii)** integrated circuit.

1996 Question 8 cont.

(c) **(i)** Name the gear trains shown in (a) and (b).



(a)



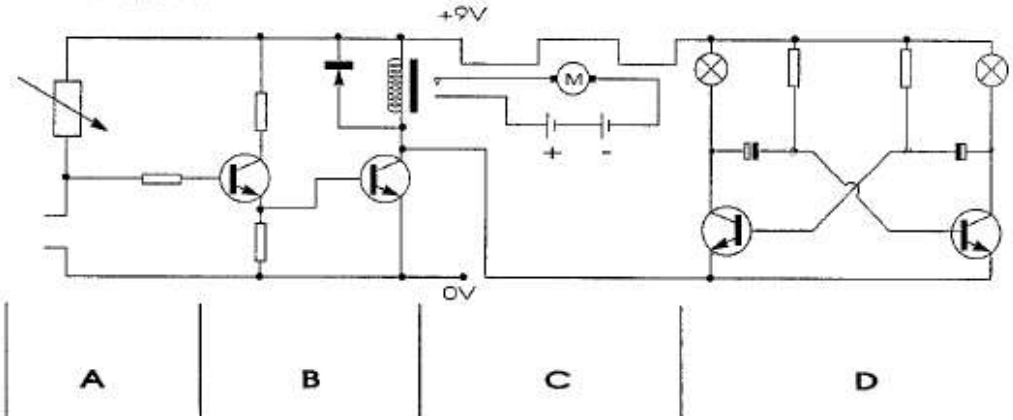
(b)

(ii) Calculate the speed in rev/min of shaft B in (b) when the driver is rotating at 900 rev/min.

(iii) Sketch and explain the principle of a worm and wormwheel mechanism.

OR

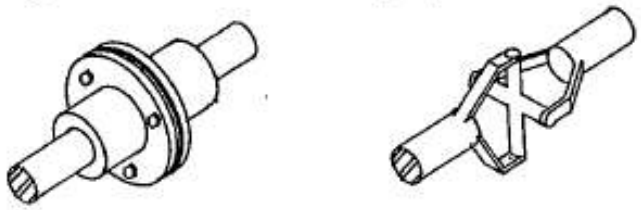
Identify the different stages marked A, B, C and D in the given electronic circuit.
What is the function of this circuit?



1997 Question 8

(a) Answer any **three** of the following:

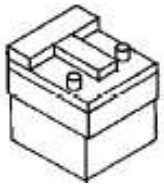
(i) Distinguish between the two shaft couplings shown below.



(ii) Compare the two gear systems shown below.

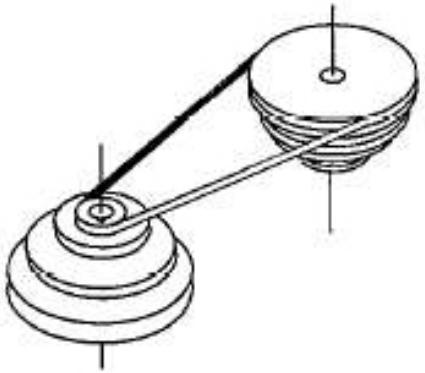
(iii) Describe an application of each thread form shown below.

(iv) Identify the energy conversion which occurs in the battery shown.

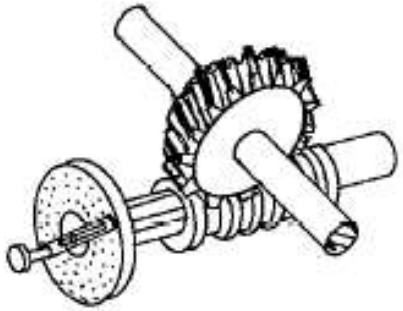


1997 Question 8 cont.

(b) The diagram shows the pulley belt drive arrangement for a drilling machine.
Explain how maximum drill speed is achieved?
Suggest how slippage might be reduced.



(c) Describe the operation and function of the mechanism below.



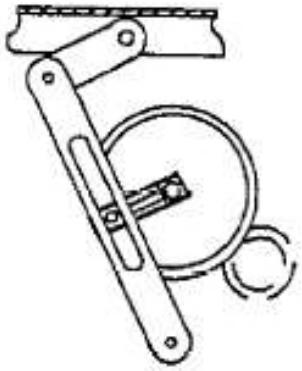
OR

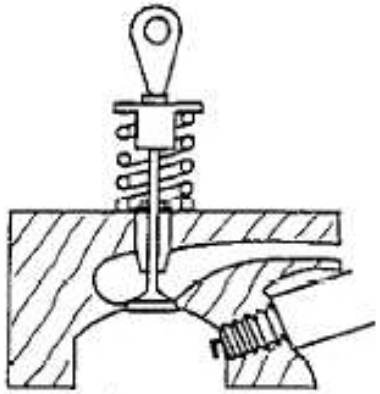
(c) Name the electronic device shown.
Explain the terms (i) Monostable; (ii) Bistable.

1998 Question 8

(a) Select <u>one</u> mechanism below and answer <u>each</u> of the following:

(i) mechanism name; (ii) operation; (iii) application.





(b) Describe the principle function of <u>any three</u> of the following:

(i) compound gear train;

(ii) mechanical clutch;

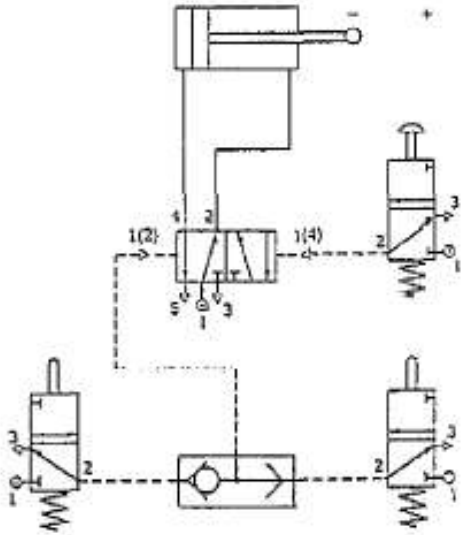
(iii) solenoid;

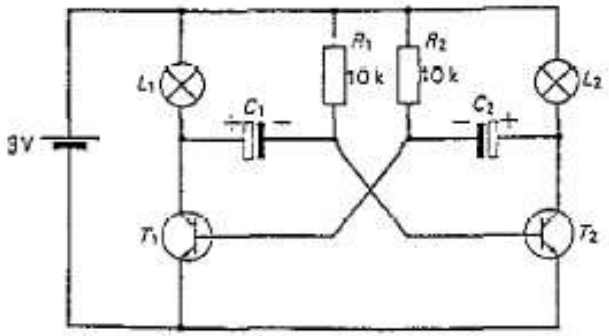
(iv) programmable logic controller;

(v) pneumatic sequencer.

1998 Question 8 cont.

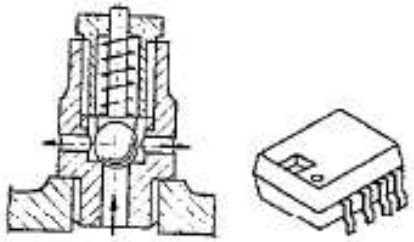
(c) Explain the operation and suggest an application for the pneumatic circuit **or** the electronic circuit shown below:





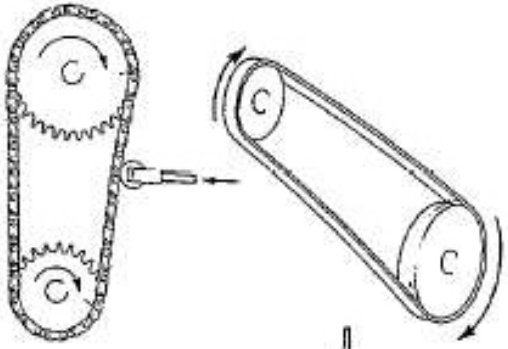
1999 Question 8

(a) Explain the function and suggest an application of any **one** item shown opposite.

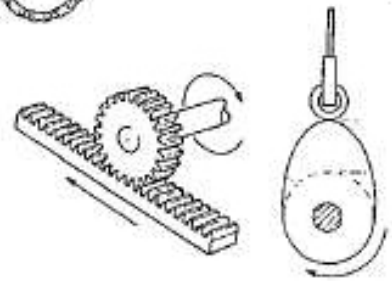


(b) Answer **any two** of the following:

(i) Compare the two drive mechanisms shown, identifying the advantages and disadvantages of both systems.



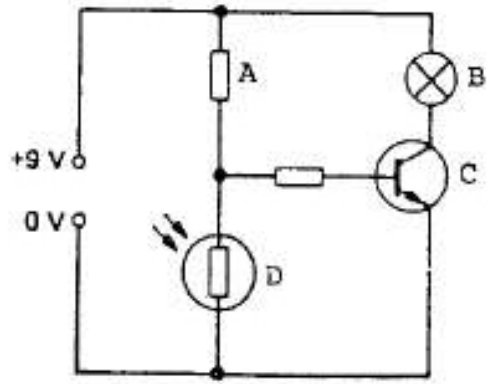
(ii) The two mechanical devices may cause a similar change of motion to occur, state the type of motion that occurs. Suggest an application for each device.



(iii) State the energy conversion that occurs in both an electric motor and a car battery.

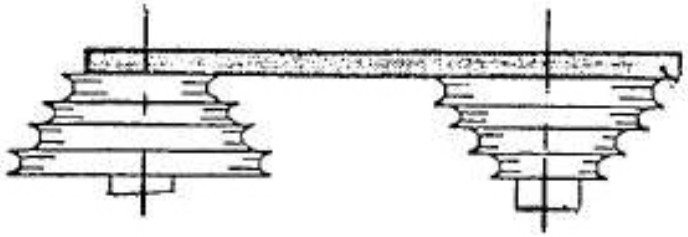
1999 Question 8 cont.

(c) Identify the electronic components marked at A, B, C and D.
Outline an application of the circuit.



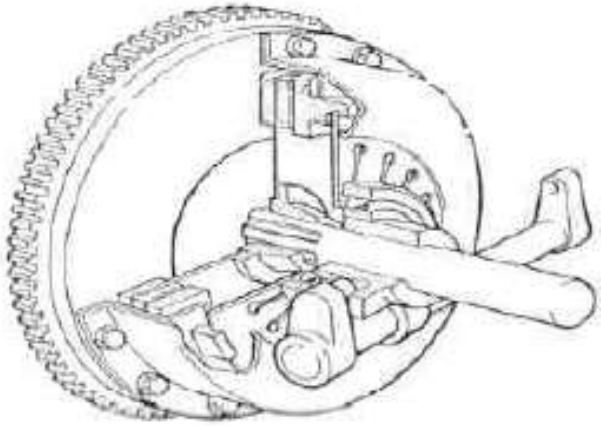
OR

(c) Describe how drilling speeds can be varied on a V-belt drive. Describe how maximum and minimum speed is achieved.

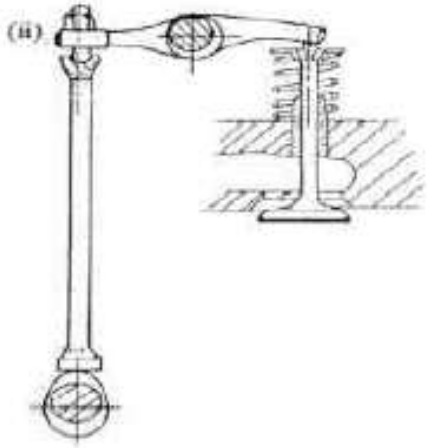


2000 Question 8

(a) Identify **any one** of the devices shown below and explain how it functions:



(ii)

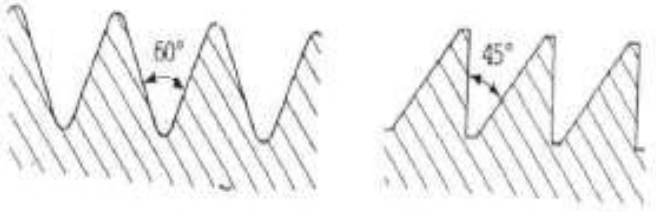


(b) Answer **any two** of the following:

(i) Briefly outline the function of a *Dividing Head;*

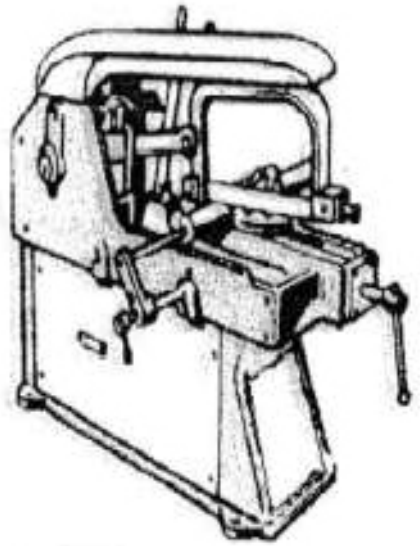
(ii) Outline the advantages helical gears have over spur gears;

(iii) Distinguish between the **two** thread forms shown and outline an application for each.



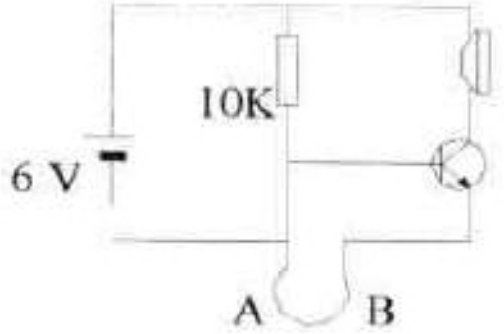
2000 Question 8 cont.

(c) Outline the working principles of the power hacksaw shown opposite.



OR

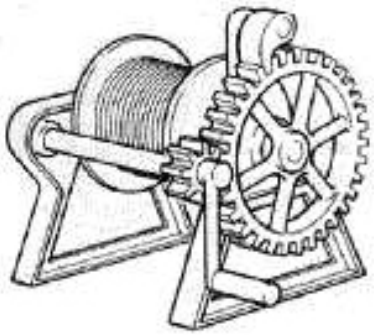
(c) Explain the operation of the electronic circuit shown and suggest an application for its use.



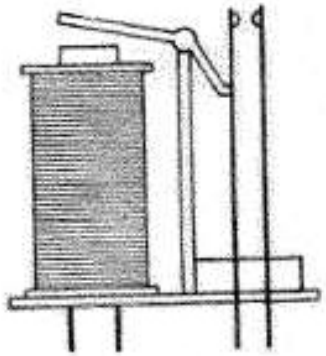
2001 Question 8

(a) Identify **any one** of the devices shown below and explain how it functions.

(i)

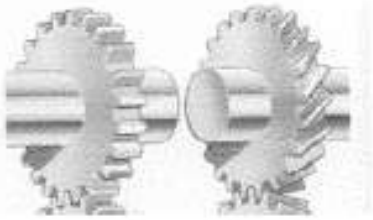


(ii)



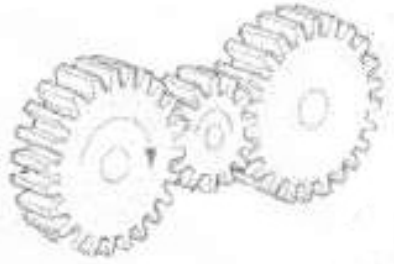
(b) Answer **any two** of the following:

(i) State the advantages of helical toothed gears over straight toothed gears as shown.



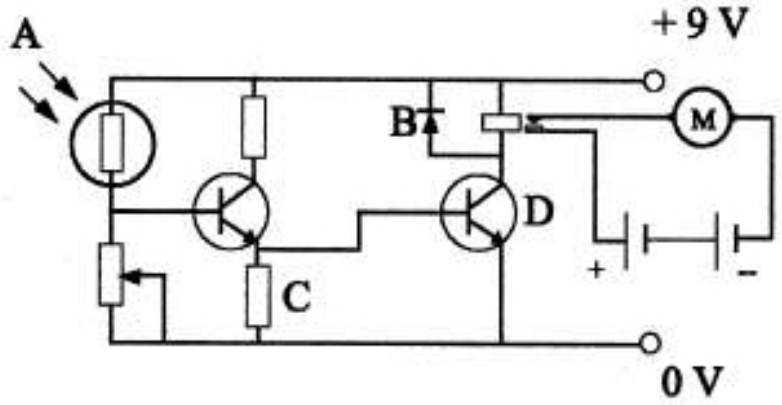
(ii) Describe **one** application of a rack and pinion mechanism.

(iii) Name the gear train shown and describe the purpose of the idler gear and outline the relationship between driver and driven gear.



2001 Question 8 cont.

(c) Identify the electronic components labelled A, B, C, D, and outline an application for the circuit.



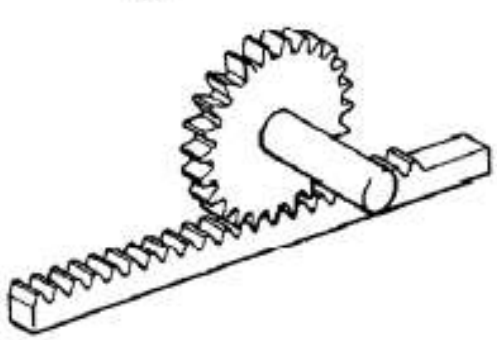
OR

(c) Describe the operation of an automatic cross slide or an automatic carriage on a centre lathe.

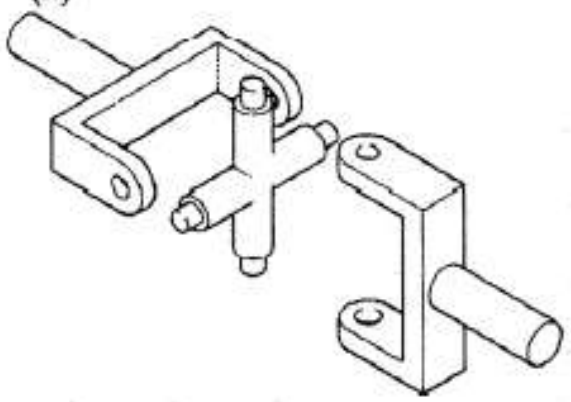
2002 Question 8

(a) Name **one** mechanism shown and outline a suitable application.

(i)



(ii)

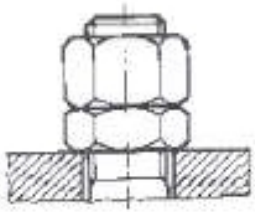


(b) Describe the principal function of **any three** of the following:

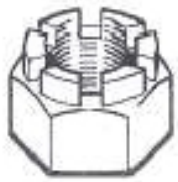
(i) Heat pump;
(ii) Ratchet mechanism;
(iii) Flywheel;
(iv) Rectifier;
(v) A non-return valve.

2002 Question 8 cont.

(c) Distinguish between the **three** types of nut shown and outline an application for each selected.

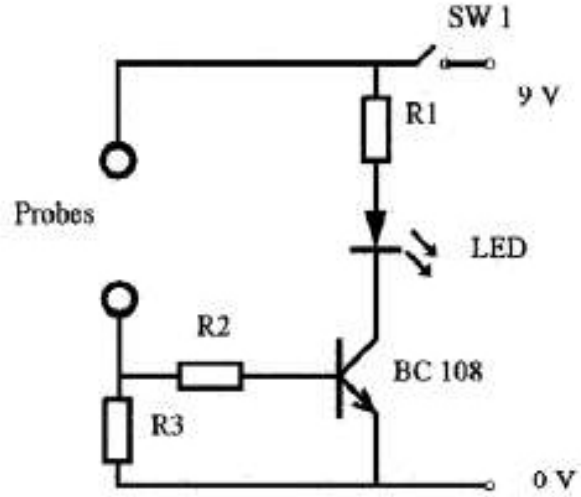
(i) 

(ii) 

(iii) 

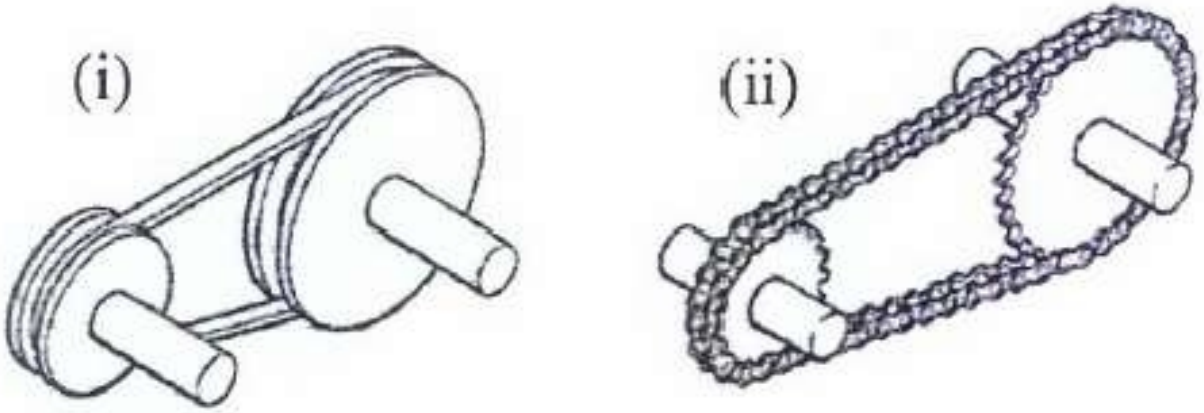
OR

(c) Describe the operation of the circuit shown, and outline an application for its use.



2003 Question 8

(a) Name **one** drive mechanism shown and outline a suitable application.



(b) Explain the function of **any two** of the following:

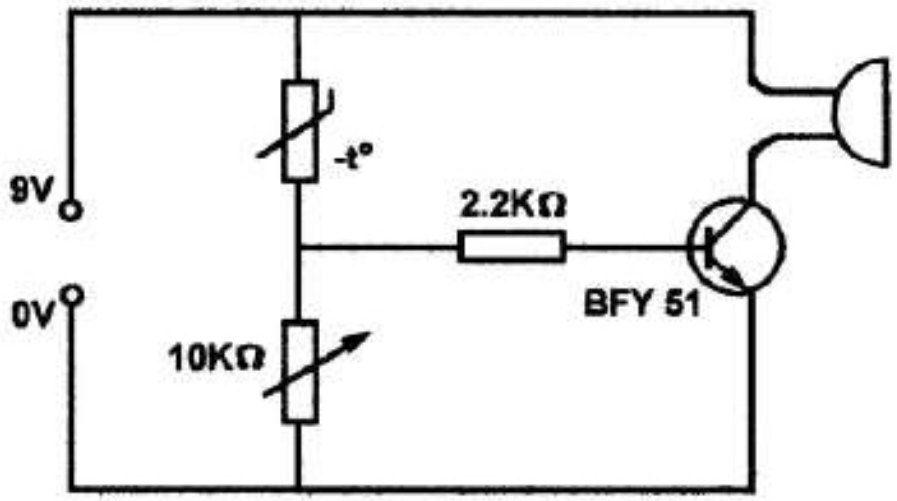
(i) Electrical relay;
(ii) Rectifier;
(iii) Transistor;
(iv) Shuttle valve;
(v) Clutch.

2003 Question 8 cont.

(c) Describe the operation and function of a quick-return mechanism.

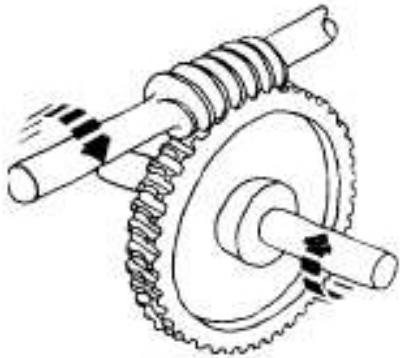
OR

(c) Describe the operation of the circuit shown and outline an application for its use.

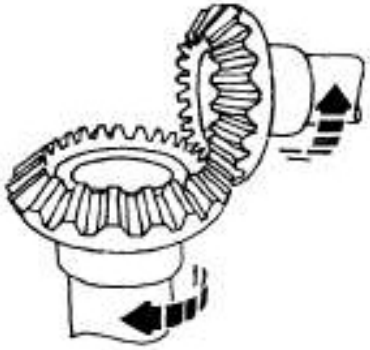


2004 Question 8

(a) Name **one** gear system shown and outline a suitable application.



(i)



(ii)

(b) Explain the function of **any three** of the following:

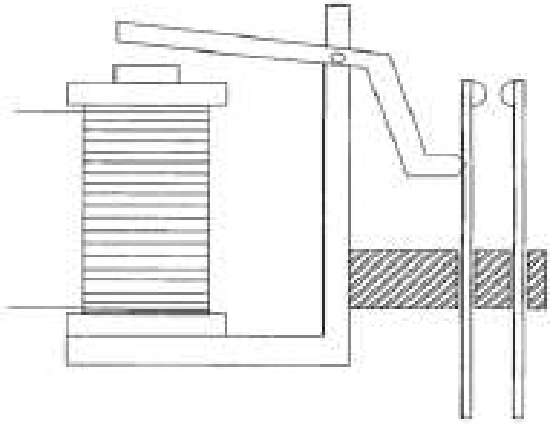
- **(i)** Ratchet;
- **(ii)** Toggle mechanism;
- **(iii)** Universal joint;
- **(iv)** Throttle valve;
- **(v)** Solenoid.

2004 Question 8 cont.

(c) Describe the operation and function of a crank and slider mechanism.

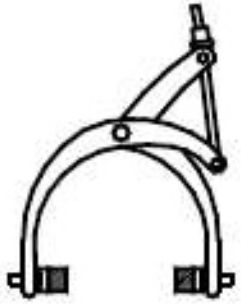
OR

(c) Identify the electrical device shown and explain how it operates.

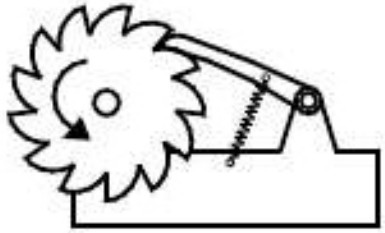


2005 Question 8

(a) Describe the operation and outline a suitable application for **one** of the mechanisms shown.



(i)



(ii)

(b) Explain the function of **any three** of the following:

- **(i)** A capacitor;
- **(ii)** A non-return valve;
- **(iii)** An idler gear;
- **(iv)** Dividing head;
- **(v)** Solar panel.

2005 Question 8 cont.

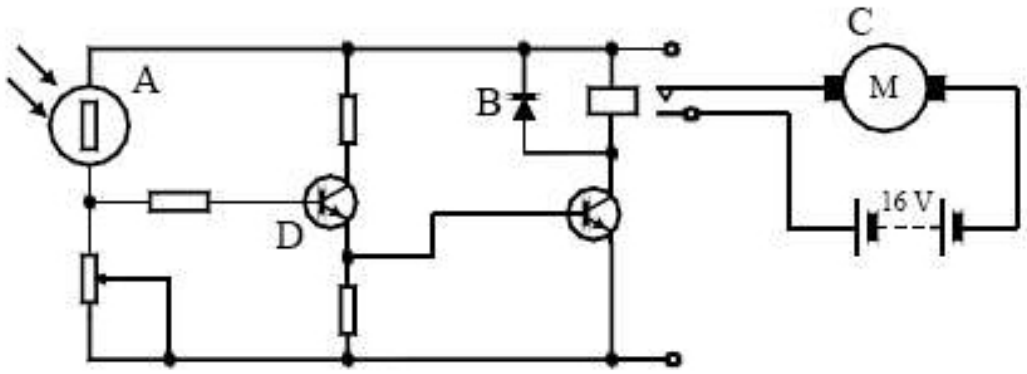
(c) Outline clearly the difference between a quick return mechanism and a slider crank mechanism.

OR

(c) With reference to the circuit shown below:

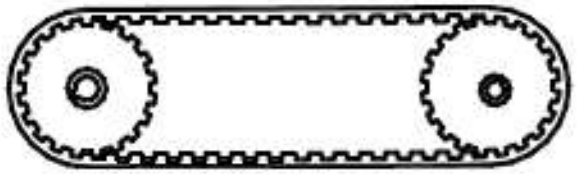
(i) Identify the electronic components A, B, C and D.

(ii) Explain the operation and suggest an application for the circuit.

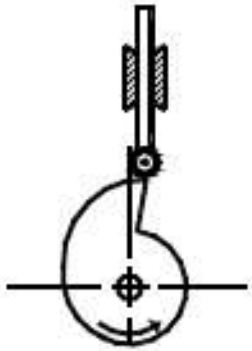


2006 Question 8

(a) Describe the operation and outline a suitable application for **one** of the mechanisms shown.



(i)



(ii)

(b) Answer **any three** of the following:

(i) Explain the function of a compound gear train;

(ii) State **one** advantage of using gears over pulleys;

(iii) Outline the function of an idler gear;

(iv) Differentiate between bevel gears and worm gears;

(v) Describe **two** applications of a rack and pinion mechanism.

2006 Question 8 cont.

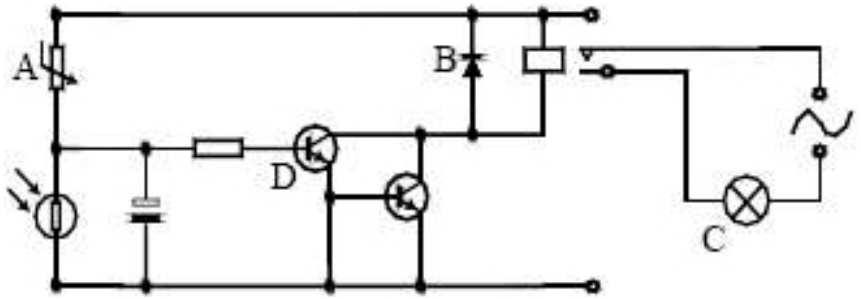
(c) Describe, with the aid of a diagram, the principle of operation of a power hacksaw.

OR

(c) With reference to the circuit shown below:

(i) Identify the electronic components A, B, C and D.

(ii) Explain the operation and suggest an application for the circuit.



2007 Question 8

(a) Name **any one** of the mechanisms shown and describe a suitable application:

(i)

(ii)

(b) Explain the function of **any three** of the following:

- **(i)** Idler gears;
- **(ii)** Universal joint;
- **(iii)** Solenoid;
- **(iv)** Pneumatic flow regulator;
- **(v)** Solar panel.

2007 Question 8 cont.

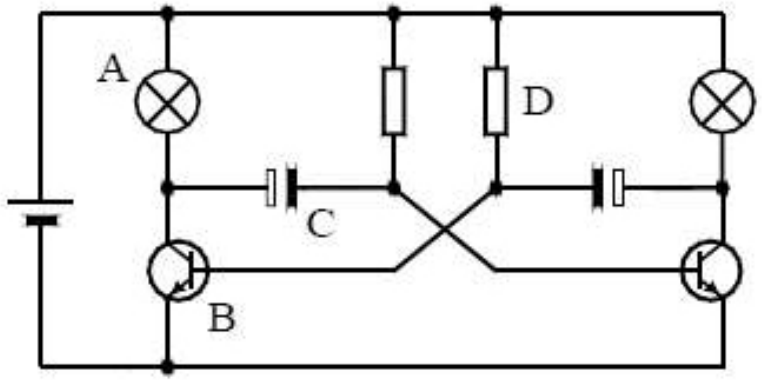
(c) Describe, with the aid of a diagram, a mechanism that could be used to automatically open a door.

OR

(c) With reference to the circuit shown below:

(i) Identify the electronic components A, B, C and D;

(ii) Describe the function of components B and C in the circuit.



2008 Question 8

(a) Name and outline a suitable application for **one** of the mechanisms shown.

(i)

(ii)

(b) Explain the function of **any three** of the following:

(i) Electrical relay;

(ii) Clutch;

(iii) Shuttle valve;

(iv) Rack and pinion;

(v) Capacitor.

2008 Question 8 cont.

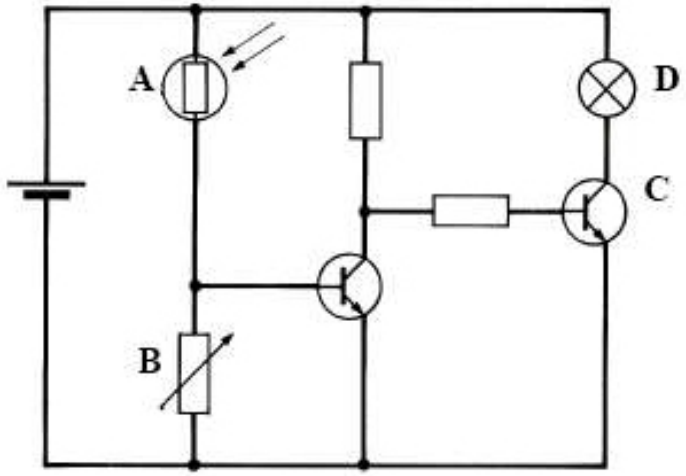
(c) Describe, with the aid of appropriate diagrams, a mechanised system that will safely elevate heavy loads.

OR

(c) With reference to the circuit shown below:

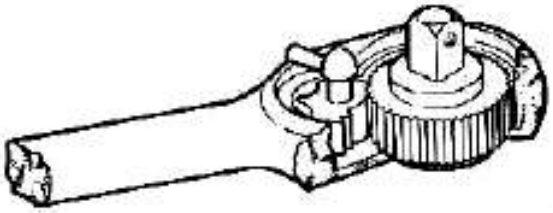
(i) Identify the electronic components A, B, C and D.

(ii) Describe the function of A and the function of B.

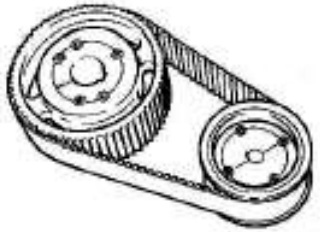


2009 Question 8

(a) Name **any one** of the mechanisms shown and describe a suitable application.



(i)



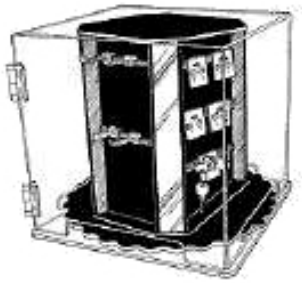
(ii)

(b) Explain **any three** of the following:

- **(i)** The advantages of helical gears;
- **(ii)** One method of preventing slip in a pulley-belt system;
- **(iii)** Crank and slider mechanism;
- **(iv)** Integrated circuit;
- **(v)** Solenoid.

2009 Question 8 cont.

(c) Describe, with the aid of suitable diagrams, a mechanism to activate a rotating jewellery display as shown.

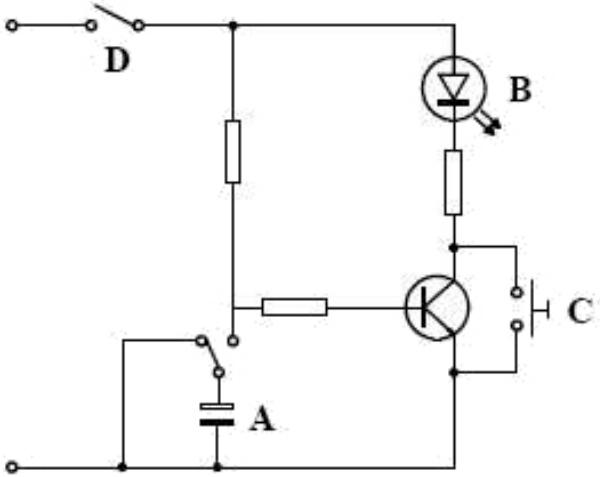


OR

(c) With reference to the circuit shown:

(i) Identify the electronic components A, B, C and D.

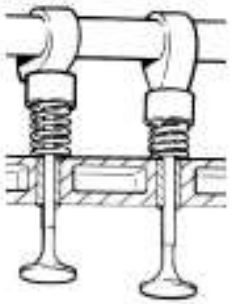
(ii) Describe the function of each of the components A and B.



2010 Question 8

(a) Name and describe the operation of **any one** of the mechanisms shown:

(i)



(ii)

(b) Explain **any three** of the following:

- **(i)** The use of bevel gears;
- **(ii)** Double-acting cylinder;
- **(iii)** Clutch;
- **(iv)** The function of an idler gear;
- **(v)** Capacitor.

2010 Question 8 cont.

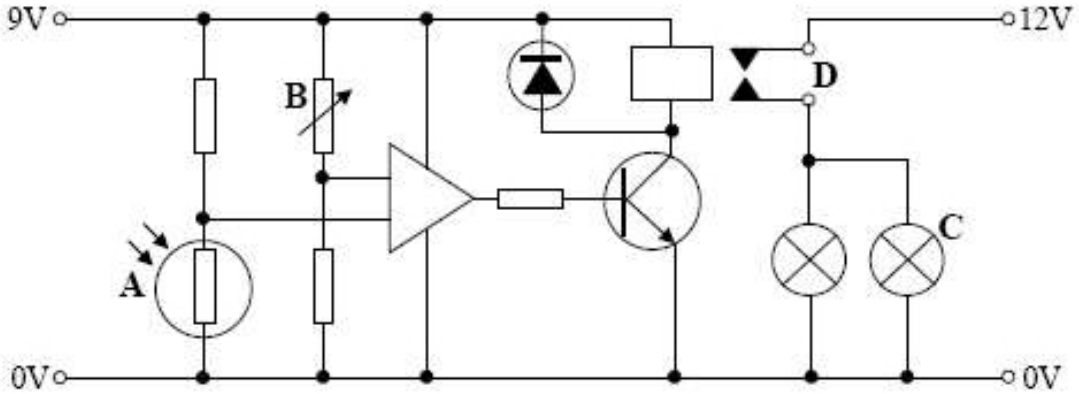
(c) Describe, with the aid of suitable diagrams, a mechanism to control the vertical movement of the dental chair shown.

OR

(c) The circuit shown is used to automatically turn on car parking lights:

(i) Identify the electronic components **A**, **B**, **C** and **D**.

(ii) Describe **two** functions of component **D** in this circuit.



2011 Question 8

(a) Name and describe the operation of **any one** of the mechanisms shown.

(i)

(ii)

(b) Explain **any three** of the following:

- **(i)** The advantages of using vee-pulley belts over flat belts;
- **(ii)** Chain and sprocket;
- **(iii)** Toggle mechanism;
- **(iv)** Light dependent resistor (LDR);
- **(v)** The functions of the electronic transistor.

2011 Question 8 cont.

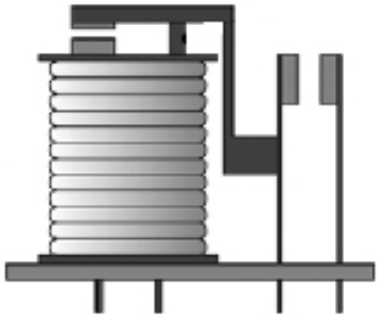
(c) Describe, with the aid of a suitable diagram, a mechanism to control the steering of the go-kart shown.

OR

(c) The electronic component shown is commonly used as a switching device:

(i) Identify the component shown.

(ii) Describe the operation of this component, making reference to the coil, armature and contacts.



2012 Question 8

(a) Name and describe the operation of **any one** of the mechanisms shown.

(i)

(ii)

(b) Explain **any three** of the following:

- **(i)** The energy conversion that occurs in a car battery;
- **(ii)** The function of an idler gear;
- **(iii)** **One** application of a ratchet and pawl mechanism;
- **(iv)** The use of a heat sink in an electronic circuit;
- **(v)** The benefits of using solar panels.

2012 Question 8 cont.

(c) Describe, with the aid of suitable diagrams, **one** method of providing independent drive to each wheel of the all-terrain surveillance vehicle shown.

OR

(c) Integrated circuit (IC) microchips are used in many electrical appliances.

(i) Identify **one** semi-conductive material used in the manufacture of integrated circuits.

(ii) Outline **two** advantages of using IC microchips rather than building circuits using traditional components.

2013 Question 8

(a) Name and describe the operation of **any one** of the mechanisms shown.

(i)

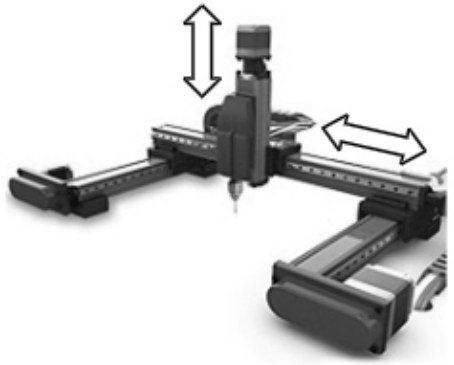
(ii)

(b) Describe **any three** of the following:

- **(i)** The advantages of toothed pulley belts;
- **(ii)** The operation and **one** application of a solenoid;
- **(iii)** **One** application for a resistor;
- **(iv)** **One** mechanical device used to convert rotary motion into linear motion;
- **(v)** A pneumatic flow regulator.

2013 Question 8 cont.

(c) The computer-controlled machine shown moves the cutter in the directions shown. Describe clearly, with the aid of diagrams, suitable drive mechanisms to control the cutter movement.



OR

(c) With reference to the IC circuit shown below:

(i) Name the input and output components in the circuit.

(ii) Name and describe the functions of component **A** in this circuit.