

Engineering Questions by Topic

Higher Level

Question 5

Welding

50 Marks



1996 Question 5

- (a)
 - (i) State two important functions of the slag produced in manual metal-arc welding.
 - (ii) State two precautions which should be taken in order to eliminate the hazards associated with mains operated metal-arc welding equipment.
- (b) In manual metal-arc welding explain, using suitable diagrams, the principle of operation when using:
 - (i) Alternating Current (AC);
 - (ii) Direct Current (DC).
- (c) Describe with the aid of a diagram the main features of an automatic welding process.

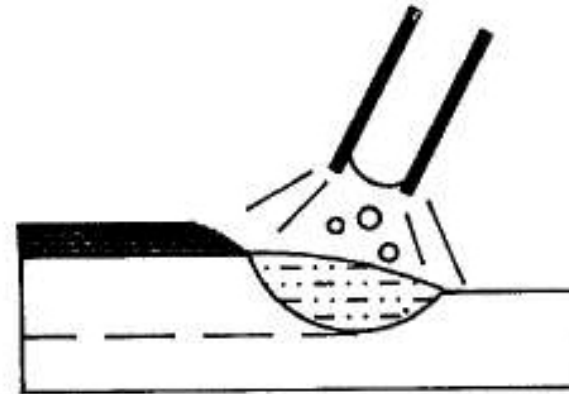
OR

- (c) In relation to the use of robots in welding explain:
 - (i) how control of the robot is affected;
 - (ii) what is meant by degrees of freedom?

1997 Question 5

(a) Explain a function and advantage of the following in relation to metal arc welding.

- (i) Multi runs;
- (ii) Shielded arc;
- (iii) Edge preparation;
- (iv) Slag.



(b) Differentiate clearly between Primary and Secondary combustion in oxy-acetylene welding.

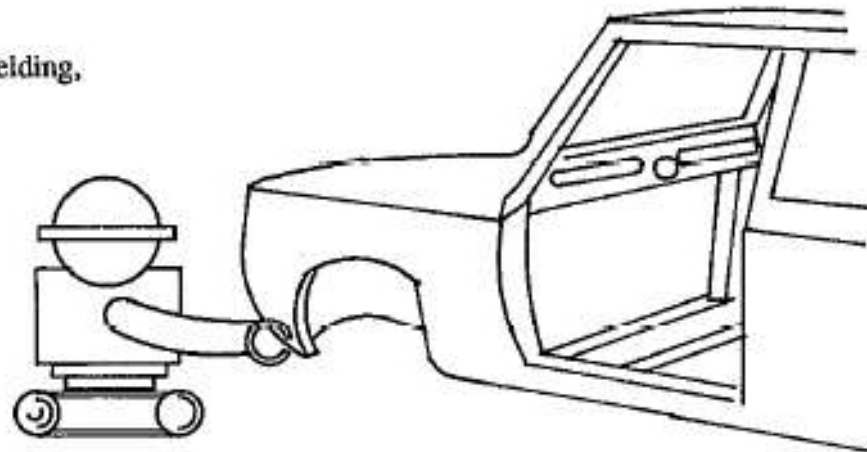
1997 Question 5 cont.

- (c) Compare Metal Inert Gas welding with Tungsten Inert Gas welding.

OR

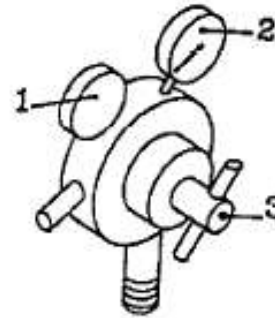
- (c) Referring to robotic control in welding, explain the following:

- (i) Yaw or Roll;
- (ii) Machine vision;
- (iii) Working envelope.



1998 Question 5

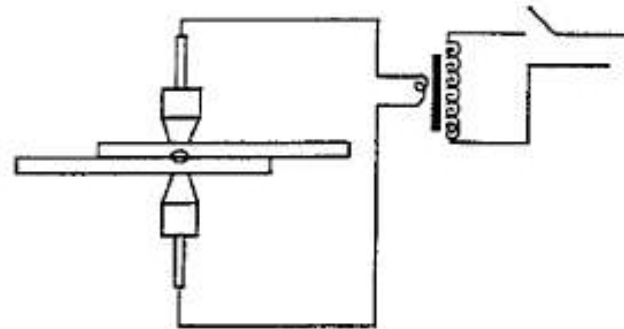
- (a) Explain the function of each numbered item shown on the welding regulator.



- (b) Briefly describe the following defects in manual metal arc welding and suggest a cause and a remedy in each case:
- (i) slag inclusions;
 - (ii) porosity;
 - (iii) lack of penetration.

1998 Question 5 cont.

- (c) Discuss the principles, function and applications of the welding process shown.



OR

- (c) (i) State four advantages of robotic control in welding and briefly describe an application suited to this type of control;
- (ii) Explain the meaning of the "Lead through" method of robot programming.

1999 Question 5

(a) Answer one of the following:

(i) Describe the two stage combustion in the neutral oxy-acetylene flame shown at A and B;



(ii) Differentiate between a carburising and an oxidising flame.

(b) Metal Inert Gas (MIG) welding is a common welding process. Describe the process using the following guidelines:

(i) Name and applications;

(ii) Main features and operation.

(c) Describe any two different ways of protecting welds from atmospheric contamination.

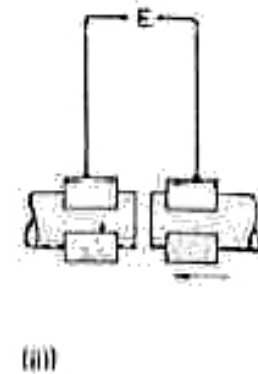
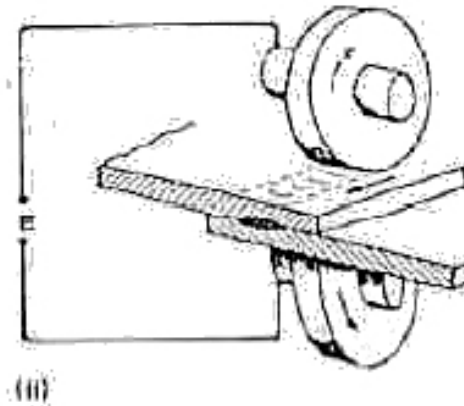
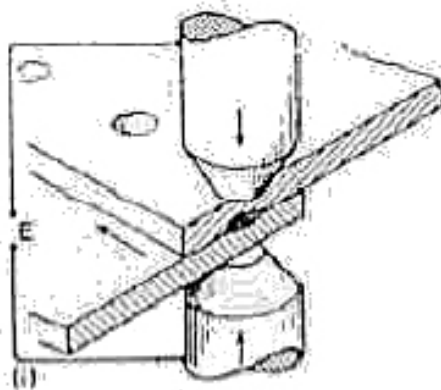
OR

(c) In relation to robotic control of welding, describe how robots are driven.

2000 Question 5

- (a) Three forms of resistance welding are shown in the diagrams below. Select one and describe the process using the following guidelines:

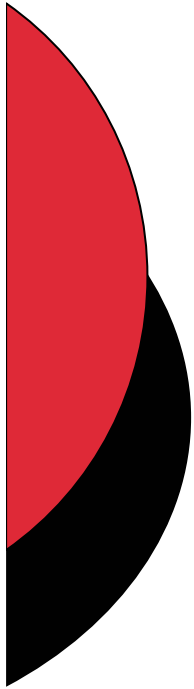
- (i) Name and operation;
(ii) Applications.



- (b) Describe the function of a (i) transformer, (ii) rectifier and (iii) capacitor in arc welding.
- (c) Describe, with the aid of a diagram, the main features of one of the following processes:
- (i) Electro-slag welding;
(ii) Submerged-arc welding.

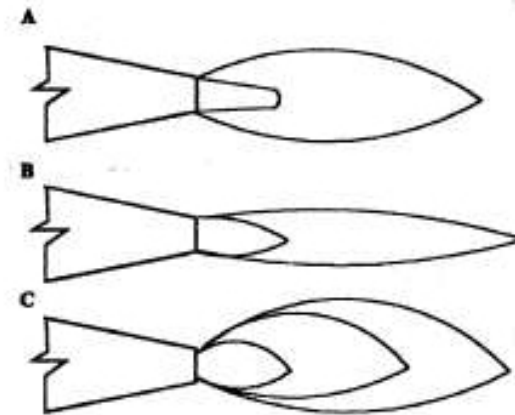
OR

- (c) Outline the advantages of using robots in industry.



2001 Question 5

- (a) Answer **any two** of the following.
- (i) What is meant by dissolved acetylene?
 - (ii) Describe the three types of flame shown at (A), (B) and (C).
 - (iii) Outline an application for each flame.



- (b) Explain why it is necessary to protect the weld area from atmospheric contamination. Outline **three** main ways by which this protection is achieved.



2001 Question 5 cont.

- (c) Describe, with the aid of a diagram, the main features, operation and application of **one** of the following welding processes.
- (i) Metal inert gas welding;
 - (ii) Tungsten inert gas welding.

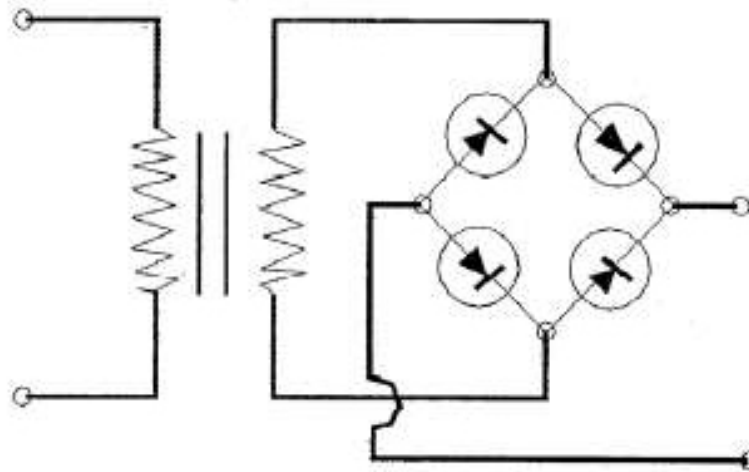
OR

- (c) Explain the following terms in relation to robotic control in welding.
- (i) Lead through method of programming;
 - (ii) Working envelope;
 - (iii) Machine vision.

2002 Question 5

(a) Describe the circuit diagram shown using the following guidelines:

- (i) Component names;
- (ii) Method of operation;
- (iii) Applications.



(b) Answer any three of the following:

- (i) State two functions of the electrode coating in manual metal arc welding;
- (ii) Distinguish between spot welding and seam welding;
- (iii) Outline the advantages multi-runs have over single-runs;
- (iv) Why is it more difficult to weld aluminium than mild steel?



2002 Question 5 cont.

- (c) Describe, with the aid of a diagram, the main features of one of the following processes:
- (i) Submerged arc welding.
 - (ii) Oxyacetylene welding.

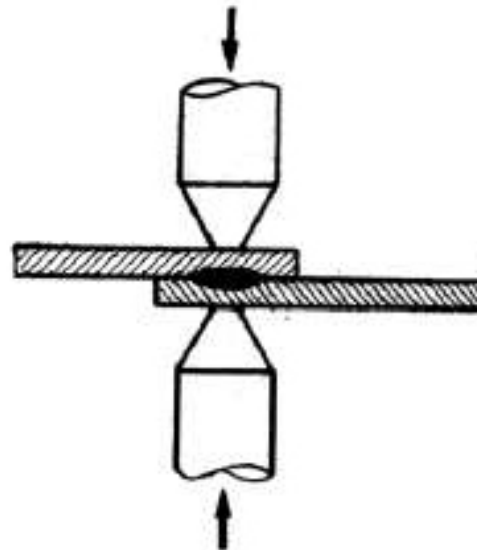
OR

- (c) Outline a welding process that is most suited to robotic control and suggest an application.

2003 Question 5

(a) Describe the welding process shown below using the following guidelines:

- (i) Name;
- (ii) Method of operation;
- (iii) Applications.



(b) Answer any three of the following:

- (i) State two safety precautions associated with oxy-acetylene welding;
- (ii) Outline two functions of the electrode coating in manual metal arc welding;
- (iii) What are the benefits of multi-run welds over single-run welds?
- (iv) Compare primary and secondary combustion in the oxy-acetylene flame.



2003 Question 5 cont.

- (c) Describe, with the aid of a diagram, the main features of a transformer used in manual metal arc welding.

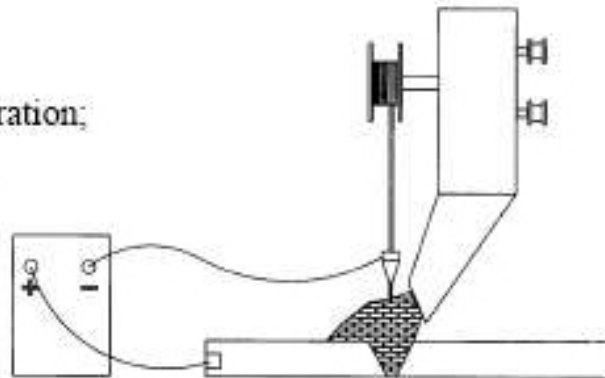
OR

- (c) Outline two advantages of the use of robotic control in welding.

2004 Question 5

- (a) Answer any three of the following:
- (i) Outline **two** ways to protect the weld pool from atmospheric contamination during welding;
 - (ii) Distinguish between an oxidising flame and a carburising flame in oxy-acetylene welding;
 - (iii) Why is tungsten inert gas welding suitable for welding aluminium?
 - (iv) State **three** important safety precautions to prevent electrical hazards associated with manual metal arc welding.
- (b) Describe the welding process shown below using the following guidelines:

- (i) Name;
- (ii) Method of operation;
- (iii) Applications.





2004 Question 5 cont.

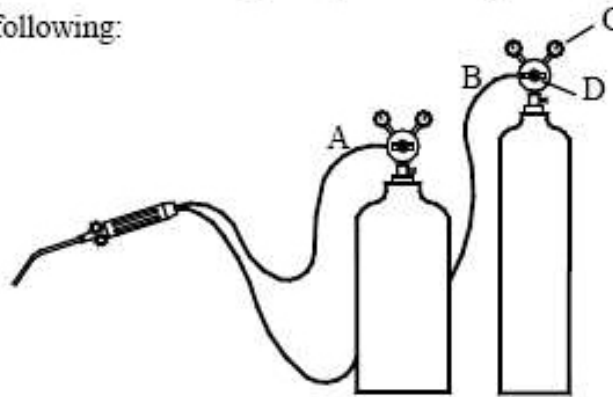
- (c) Describe, with the aid of a diagram, the main features of metal inert gas welding.

OR

- (c) State two important factors that should be considered when designing a robot for welding.

2005 Question 5

- (a) Describe, with the aid of a diagram, the main features of **one** of the following:
- (i) Electro-slag welding;
 - (ii) Seam welding.
- (b) With reference to oxy-acetylene welding, answer **any three** of the following:



- (i) Name the colour coding used for hose A and hose B;
- (ii) Identify and explain the function of components C and D;
- (iii) State **three** important safety precautions to be observed when using oxy-acetylene equipment;
- (iv) What is meant by dissolved acetylene?
- (v) Distinguish between an oxidising flame and a carburising flame.



2005 Question 5 cont.

(c) Outline the function of the following in manual metal arc welding:

- (i) Bridge rectifier;
- (ii) Transformer.

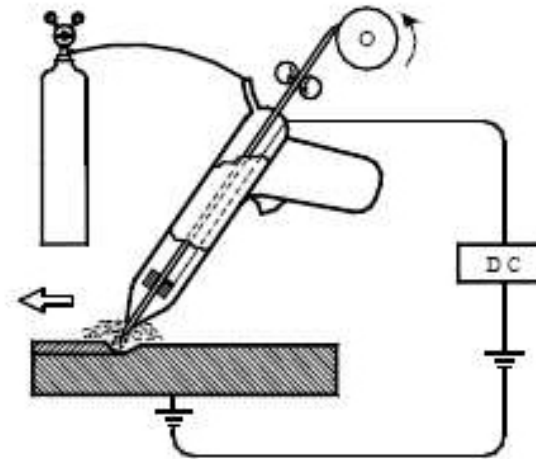
OR

- (c) (i) Identify **one** welding process suitable for robotic control.
- (ii) State **two** industrial applications for robotic controlled welding.

2006 Question 5

(a) Describe the welding process shown using the following guidelines:

- (i) Name;
- (ii) Method of operation;
- (iii) Applications.



(b) With reference to manual metal arc welding answer **any three** of the following:

- (i) State **two** functions of the electrode coating;
- (ii) Outline **two** important functions of the slag produced;
- (iii) Explain the operation of a bridge rectifier;
- (iv) Identify **three** potential safety hazards and suggest a suitable remedy for each.



2006 Question 5 cont.

- (c) Describe, with the aid of a suitable diagram, the main features of **one** of the following:
- (i) Resistance spot welding.
 - (ii) Tungsten inert gas welding.

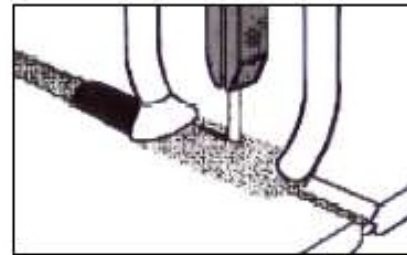
OR

- (c) (i) Outline the benefits of using robots in car assembly.
- (ii) In robotic control explain the meaning of the working envelope.

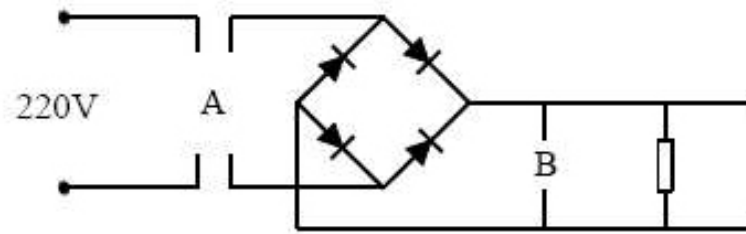
2007 Question 5

- (a) The diagram illustrates the process of submerged arc welding. Describe the main features of this type of welding making reference to:

- (i) principle of operation;
- (ii) applications.



- (b) With reference to manual metal arc welding, answer **any three** of the following:



- (i) Redraw the incomplete welding transformer circuit shown and insert the missing components for A and B;
- (ii) Describe the purpose of the components A and B;
- (iii) What are the advantages of multi-run welds?
- (iv) Outline **three** safety precautions associated with the preparation of materials and equipment for welding.



2007 Question 5 cont.

- (c) Describe, with the aid of a suitable diagram, the main features of **one** of the following:
- (i) Resistance seam welding;
 - (ii) Electro-slag welding.

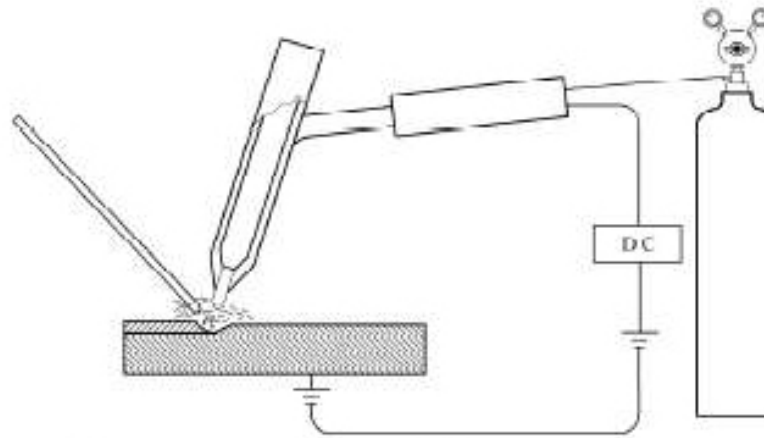
OR

- (c) (i) Describe **two** advantages of using robots in electronic circuit assembly.
- (ii) Identify **two** safety factors to be considered when setting up a robotic welding facility.

2008 Question 5

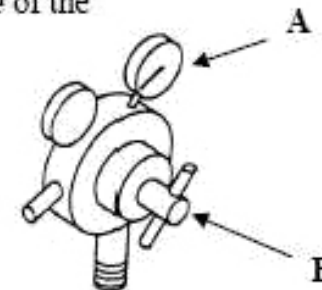
(a) Describe the welding process shown below under the following headings:

- (i) Name;
- (ii) Method of operation;
- (iii) Applications.



(b) With reference to oxy-acetylene welding answer **any three** of the following:

- (i) Identify **two** safety features incorporated in oxy-acetylene equipment;
- (ii) Explain the functions of part A and of part B;
- (iii) Describe the term *dissolved acetylene*;
- (iv) Distinguish clearly between oxidising and carburising flames.





2008 Question 5 cont.

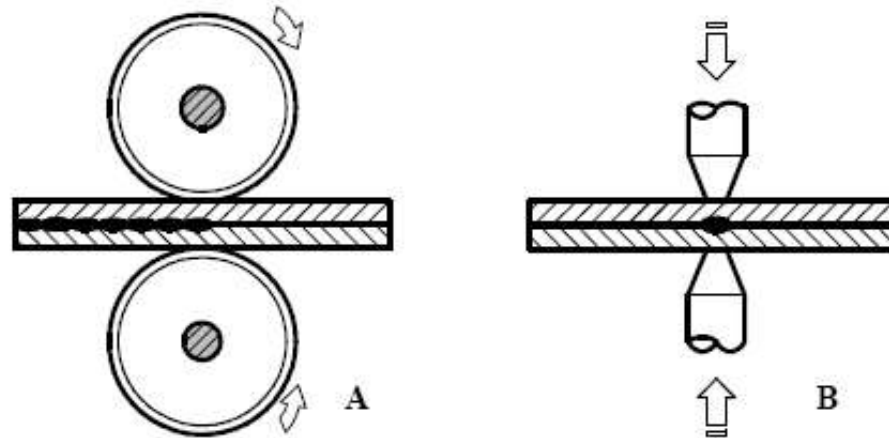
- (c) Describe, with the aid of a suitable diagram, the main features of **one** of the following:
- (i) Resistance spot welding;
 - (ii) Metal inert gas welding.

OR

- (c) (i) Identify **two** industrial applications where robotic control is used.
- (ii) Outline the advantages of using stepper motors in the control of robotic movement.

2009 Question 5

(a) Two resistance welding processes are illustrated at A and B below.



- (i) Name the **two** resistance welding processes.
- (ii) Describe the principles of operation for **any one** of these resistance welding processes.
- (b) Answer **any three** of the following:
- (i) Distinguish clearly between the applications of MIG welding and the applications of TIG welding.
- (ii) State **two** functions of the electrode coating in manual metal arc welding;
- (iii) Describe **two** factors to be considered when installing a welding station in a school workshop;
- (iv) Describe multi-run welding.



2009 Question 5 cont.

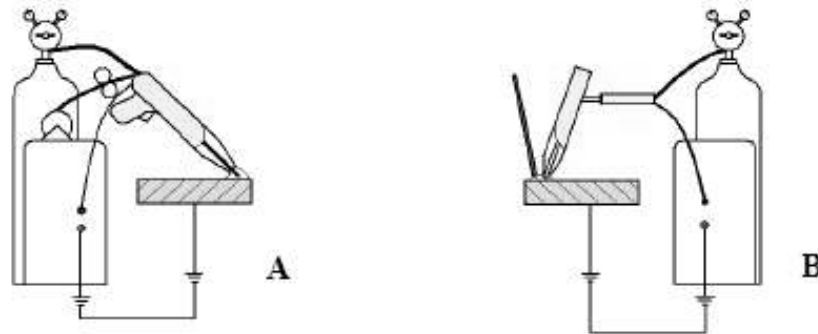
- (c) Describe, with the aid of suitable diagrams, the main features of **one** of the following:
- (i) The transformer circuit used in manual metal arc welding.
 - (ii) Submerged arc welding.

OR

- (c) (i) Outline the advantages of using pneumatic control to power robots for heavy duty vehicle assembly.
- (ii) Describe the benefits of using robotic control in a hazardous manufacturing environment.

2010 Question 5

- (a) Two industrial welding processes are illustrated at **A** and **B** below.



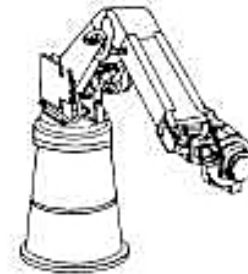
- (i) Name the **two** welding processes;
 - (ii) Identify **one** application for **each** process;
 - (iii) Describe the principles of operation for **any one** of these welding processes.
- (b) Answer **any three** of the following:
- (i) Describe **three** important safety features integrated into the equipment used for oxyacetylene welding;
 - (ii) State **two** functions of the slag produced in manual metal arc welding;
 - (iii) Identify **one** use for submerged arc welding (SAW);
 - (iv) Describe the principle of resistance welding.

2010 Question 5 cont.

- (c) Describe, with the aid of suitable diagrams, the main features of **one** of the following:
- (i) Electro-slag welding;
 - (ii) Oxyacetylene welding.

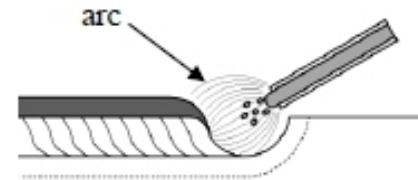
OR

- (c) Outline the advantages of using robotic control for **each** of the following engineering applications:
- (i) Spray painting vehicle body parts;
 - (ii) Testing gas pipes;
 - (iii) Placement of electronic components on circuit boards.

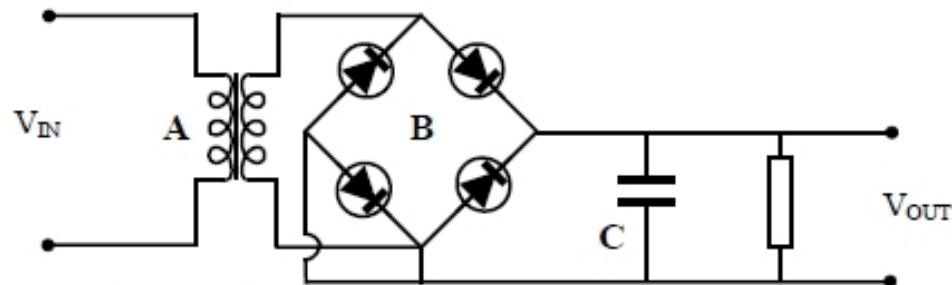


2011 Question 5

- (a) The process of manual metal arc welding (MMA) is illustrated.



- (i) Describe the principles of operation of MMA welding.
- (ii) Identify the **three** main parts A, B and C of the MMA welding circuit shown and state the function of each part.



- (b) Answer any **three** of the following:
- (i) Describe **three** important safety features that minimise electrical hazards associated with manual metal arc welding;
- (ii) Outline **three** methods of preventing atmospheric contamination of the weld area;
- (iii) Why is tungsten inert gas welding suitable for welding aluminium?
- (iv) Explain the function of dissolved acetylene in oxy-acetylene welding.



2011 Question 5 cont.

- (c) Describe, with the aid of a suitable diagram, the main features of **one** of the following:
- (i) Seam resistance welding;
 - (ii) Submerged arc welding (SAW).

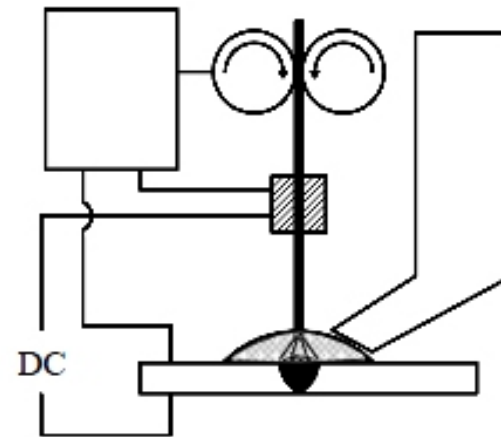
OR

- (c) (i) Explain the robotic control terms:
- *work envelope* and
 - *degree of freedom*.
- (ii) Outline **one** advantage of the use of stepper motors rather than DC motors in robotic control.



2012 Question 5

- (a) The process of submerged arc welding (SAW) is illustrated.
- (i) Describe the principles of operation of submerged arc welding (SAW).
 - (ii) Identify **one** application of SAW.





2012 Question 5 cont.

- (b) Answer any three of the following:
- (i) Describe, with examples, the importance of colour coding in oxyacetylene equipment;
 - (ii) Outline **three** safety precautions that should be observed in the preparation of equipment and materials for oxyacetylene welding;
 - (iii) Describe multi-run welds;
 - (iv) Describe **one** type of welding suitable for the automated welding of steel panels in motorcar manufacture.



2012 Question 5 cont.

- (c) Describe, with the aid of suitable diagrams, the main features of **one** of the following:
- (i) Tungsten Inert Gas (TIG) welding;
 - (ii) Manual metal arc (MMA) welding.

OR

- (c) Resistance spot welding is extensively used in robot controlled engineering manufacture.
- (i) Explain why resistance spot welding is suitable for robotic control.
 - (ii) Identify **two** other industrial processes where robotic control is widely used.



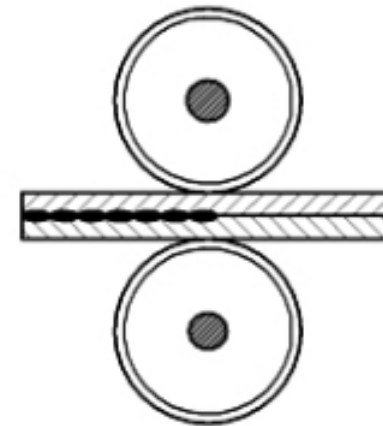


2013 Question 5

- (a) Answer any **three** of the following:
- (i) Describe **three** hazards associated with the use of manual metal arc welding in a school engineering room.
 - (ii) Outline the functions of the *transformer*, *capacitor* and *rectifier* in manual metal arc welding.
 - (iii) State **two** functions of the electrode coating in manual metal arc welding.
 - (iv) State specific uses for **each** of the following welding processes:
 - Tungsten inert gas (TIG) welding
 - Submerged arc welding (SAW)
 - Oxy-acetylene welding.

2013 Question 5 cont.

- (b) A resistance welding process is illustrated.
- (i) Name this resistance welding process.
 - (ii) Identify **one** application for this process.
 - (iii) Describe in detail, the key principles of resistance welding.



2013 Question 5 cont.

- (c) Describe, with the aid of suitable diagrams, the main features of **one** of the following:
 - (i) Metal inert gas (MIG) welding;
 - (ii) Electro-slag welding.

OR

- (c) The use of robotic welding has increased steadily over the past 25 years and now accounts for approximately 20% of all industrial robotic applications.
 - (i) Name **two** types of welding suitable for robotic control.
 - (ii) Identify **two** other industrial processes that can be controlled by robotic techniques.

