

# Engineering Questions by Topic

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Ordinary Level

Question 3

45 Marks



# 1996 Question 3

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- (a) Describe the process and purpose of tempering.
- (b) State two differences between:
  - (i) annealing; (ii) ductility.
- (c) Describe the process of pack hardening (case-hardening) and give one example for its use.
- (d) Identify two other methods of surface hardening.



# 1997 Question 3

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- (a) Name the **three main classes** of fit in the assembly between a hole and shaft and explain the purpose of each class of fit.
- (b) The limits of a hole and shaft assembly are shown in the table below.

LIMITS	HOLE	SHAFT
High Limit	60.03	60.051
Low Limit	60.00	60.032

- State:
- (i) The tolerance on each part;
  - (ii) The maximum allowance;
  - (iii) The minimum allowance;
  - (iv) The type of fit.

**OR**

- (b) Describe the operation of **one** of the following:
- (i) A control system operated by a bi-metal strip;
  - (ii) A *Pop Rivet Gun*.



# 1998 Question 3

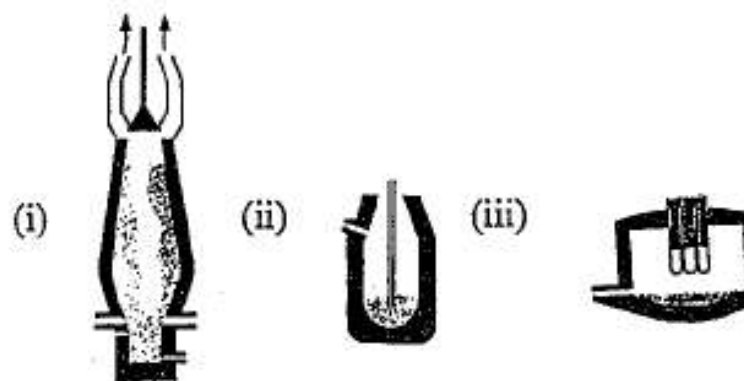
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- (a) Describe in stages how cast iron is produced.
- (b) Name three pieces of equipment produced from cast iron, listing the advantages over other metals.
- (c) Give brief descriptions of the properties and uses of the following metals:
- (i) Mild Steel; (ii) Copper; (iii) Carbon Steel; (iv) Aluminium.

# 1999 Question 3

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(a) Name the furnaces shown:



- (b) Describe the operation of **any one** furnace and the type of material produced.
- (c) Name the ores from which aluminium and lead are produced.
- (d) Name **two** applications for chromium.



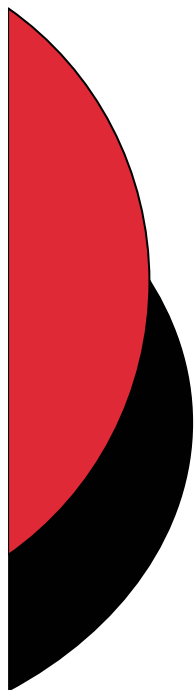
## 2000 Question 3

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- (a) State the type of furnace used to produce each of the following materials:
- (i) Pig iron;                      (ii) Mild Steel;                      (iii) Cast Iron.
- (b) Explain the following terms and name the materials with these properties.
- (i) Brittleness;                      (ii) Ductility.
- (c) State with reasons, the material you would recommend for making the following:
- (i) The bit of a soldering iron;                      (ii) The bed of the centre lathe.

**OR**

- (c) Explain any **three** of the following CNC terms:
- (i) tool off-sets;                      (ii) stepper motor;  
(iii) canned cycle;                      (iv) part programme;  
(v) peck drilling.



## 2001 Question 3

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- (a) Name three modern methods used for the production of steel, and describe one method with the aid of a labelled diagram.
- (b) What is an alloy?
- (c) Name the materials used and the reason for the choice in the manufacture of the following:  
(i) Lathe bed; (ii) Centre punch; (iii) Motor cycle Windshield.
- (d) Name the ores from which tin and lead are produced.



## 2002 Question 3

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- (a) Name the process used to produce each of the following materials:
- (i) Pig Iron;      (ii) Steel;      (iii) Cast Iron.
- (b) With the aid of a diagram, explain one of the processes in (a).
- (c) What metals make up the composition of soft solder?
- (d) Name two non-ferrous metals.

**OR**

- (d) Name two types of electrical circuit.

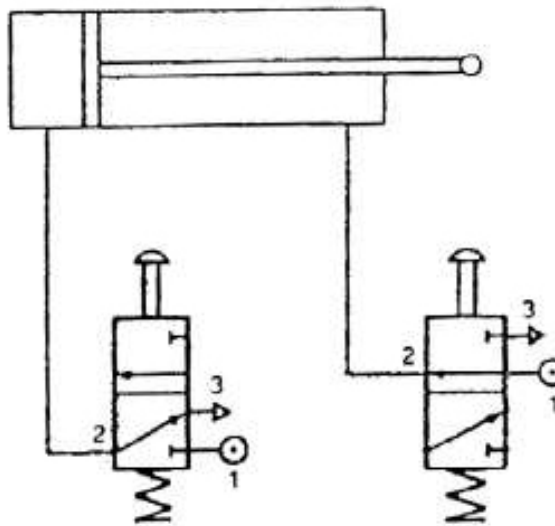


# 2003 Question 3

- (a) Name three different methods used in the heat treatment of steel.
- (b) Describe the carburising process for case-hardening mild steel components.
- (c) Explain the effect of heat treatment on copper.
- (d)
  - (i) Explain hardness in relation to the properties of metals.
  - (ii) What is work hardening?

OR

- (d) Explain how the pneumatic circuit shown operates and give an example of the use of such a circuit.



# 2004 Question 3

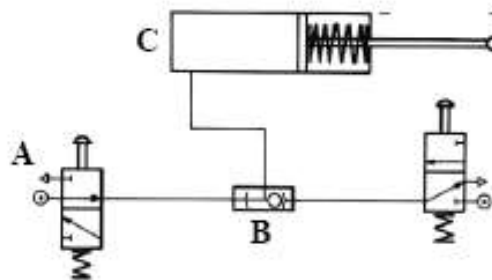
- (a) Explain the difference between hardening and annealing of metals.
- (b) Name the heat treatment used to produce a hard surface on mild steel components.
- (c) (i) Describe the different heat treatments applied to Part A and Part B of the center punch.



- (ii) Why are the different treatments necessary?
- (d) Explain the difference between the following cooling media in heat treatment:
- (i) Oil; (ii) Water.

OR

- (d) Name any two of the components A, B and C shown in the pneumatic circuit.



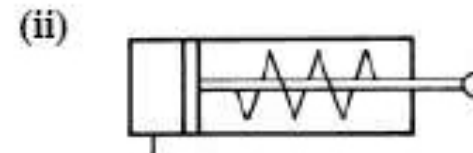
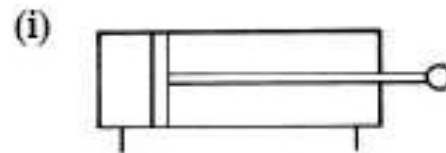
# 2005 Question 3

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- (a) Explain what is meant by any one of the following:
- (i) Work hardening, (ii) Case hardening, (iii) Annealing.
- (b) Name the materials used in the manufacture of any two of the following:
- (i) Hand file, (ii) Twist Drill, (iii) Screwdriver point.
- (c) Describe how the cutting edge of a cold chisel is:
- (i) Hardened;  
(ii) Tempered.
- (d) Explain each of the following in relation to the properties of metals.
- (i) Malleability, (ii) Ductility.

OR

- (d) Name each of the pneumatic cylinders below:



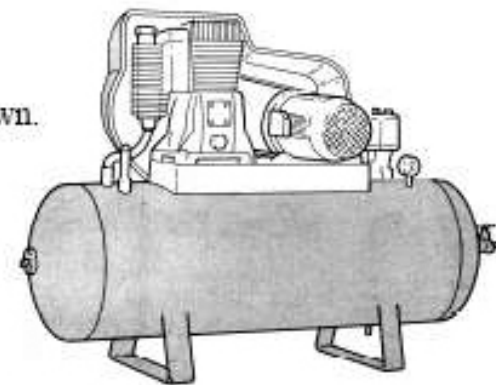
# 2006 Question 3

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- (a) Explain the condition of high carbon steel when:
  - (i) Cooled **quickly** from a temperature of  $900^{\circ}\text{C}$ ;
  - (ii) Allowed to cool **slowly** from a temperature of  $900^{\circ}\text{C}$ .
- (b) Explain **any two** of the following terms in relation to the properties of metals:
  - (i) Toughness,           (ii) Malleability,           (iii) Elasticity.
- (c) What does *case hardening* mean?
- (d) Identify **two** safety precautions required when working with hot metals.

OR

- (d) Give **two** applications for the pneumatic compressor shown.



# 2007 Question 3

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(a) Explain **any one** of the following heat treatment processes:

- (i) Annealing,           (ii) Case hardening.

(b) Describe how the point of the scriber shown is hardened and tempered.



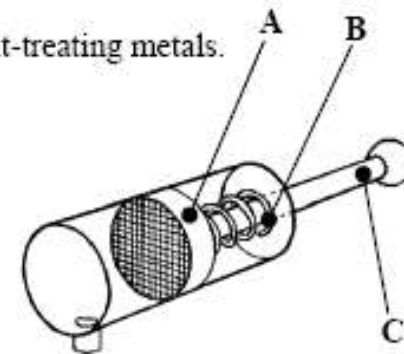
(c) Explain **any two** of the following metal properties:

- (i) Brittleness,                           (ii) Ductility,                           (iii) Malleability.

(d) Identify **any two** items of protective clothing to be worn when heat-treating metals.

OR

(d) Name **any two** of the parts A, B and C shown on the pneumatic cylinder.



# 2008 Question 3

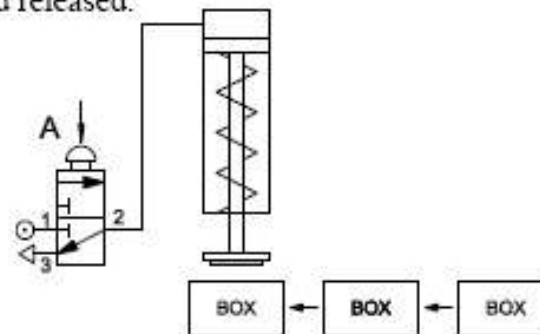
- (a) Describe the changes in the mechanical properties of high carbon steel:
- (i) if it is heated to a cherry red and cooled **quickly**;
  - (ii) if it is heated to a cherry red and cooled **slowly**.
- (b) Identify the different heat treatments applied to: (i) the head and (ii) the cutting edge of a cold chisel, as shown.



- (c) Identify **two** safety precautions to be observed when using oil for cooling during heat treatment.
- (d) Describe the *case hardening* process which can be carried out on low carbon steel.

OR

- (d) A pneumatic circuit used to stamp boxes is shown. Explain what happens when push button **A** is pressed and released.



# 2009 Question 3

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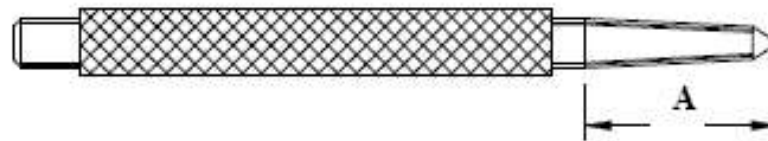
(a) Explain any two of the following processes:

(i) Annealing,

(ii) Case hardening,

(iii) Work hardening.

(b) Describe how part A of the centre punch shown is hardened and tempered.



(c) Outline two safety precautions to be observed when hardening and tempering the point of a centre punch.

(d) Describe any two of the following metal properties:

(i) Malleability,

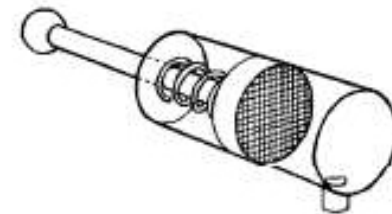
(ii) Elasticity,

(iii) Brittleness.

OR

(d) (i) Identify the pneumatic component shown.

(ii) Describe a suitable application for this pneumatic component.



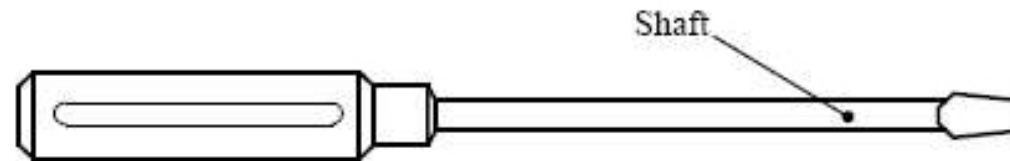




# 2010 Question 3

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- (a) Name and describe the heat treatment process required to achieve each of the following:
- (i) soften copper before hollowing;
  - (ii) reduce the hardness in the point of a centre punch.
- (b) Describe how the mild steel shaft of the screwdriver shown is case-hardened.



- (c) List **two** reasons why it is necessary to wear protective clothing when heat treating metals.
- (d) State the main difference between *low carbon steel* and *high carbon steel*.

OR

- (d) Describe **two** applications of robotics in the car manufacturing industry.





# 2011 Question 3

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(a) Describe **any two** of the following heat treatment processes:

- (i) Hardening,                      (ii) Annealing,                      (iii) Tempering.

(b) (i) Outline **one** reason for the damage to the point of the centre punch, shown at A.



(ii) Explain **one** method to prevent damage to the point of a centre punch.

(c) State **two** safety precautions to be observed when using water for *cooling* during heat treatment.

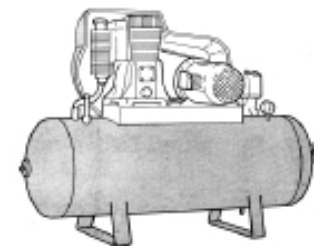
(d) Describe **any two** of the following material properties:

- (i) Brittleness,                      (ii) Malleability,                      (iii) Conductivity.

**OR**

(d) (i) Explain the engineering technology term *pneumatics*.

(ii) State **one** application for a pneumatic circuit.



# 2012 Question 3

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- (a) Explain any two of the following terms:  
(i) Case hardening,      (ii) Annealing,      (iii) Work hardening.

- (b) (i) Describe how the point A of the chisel shown is hardened and tempered.



- (ii) Explain why it is important to temper point A of the chisel.

- (c) State two safety precautions to be observed when heat treating the point of the chisel.

- (d) Explain any two of the following metal properties:

- (i) Toughness,      (ii) Ductility,      (iii) Melting point.

OR

- (d) (i) Describe one application for robotics in the manufacturing industry.  
(ii) State one advantage for using robotics in the manufacturing industry.



# 2013 Question 3

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- (a) (i) Explain the difference between hardening and annealing of metals.  
(ii) Name a heat treatment process used to produce a hard surface on mild steel components.
- (b) (i) Explain how the twist drill shown below is hardened during manufacture.



- (ii) State **one** other heat treatment process used during the manufacture of a twist drill.
- (c) State **two** safety precautions to be observed when using water for cooling during the heat treatment of metals.
- (d) Explain **any two** of the following terms:
  - (i) Work hardening,
  - (ii) Brittleness,
  - (iii) Tempering.

OR

- (d) (i) Describe **one** application for pneumatics in the manufacturing industry.  
(ii) State **one** advantage of using pneumatics in the manufacturing industry.

