



2850-255 DECEMBER 2014

Level 2 Certificate/Diploma in Engineering (IVQ)

Principles of fabrication and welding technology

Wednesday 10 December 2014
09:30 – 11:30

**You should have the
following for this examination**

- one answer book
- drawing instruments
- calculator

General instructions

- All intermediate steps in calculations **must** be shown.
- All questions do **not** carry equal marks. The maximum marks for each section within a question are shown.
- Answer **all** questions.

Practice

- 1 a) With the aid of a labelled sketch, describe the heat distribution of the arc when TIG welding using DC Electrode Negative (DCEN). (3 marks)
- b) Describe the cause of arc blow when Manual Metal Arc (MMA) welding. (2 marks)
- c) State **one** method of reducing the effect of arc blow. (1 mark)
- (Total marks 6)
- 2 a) State **two** types of coverings for MMA electrodes. (2 marks)
- b) State **four** functions of the electrode covering. (4 marks)
- (Total marks 6)
- 3 a) State **two** gases that could be added to Argon to increase the weld heat input. (2 marks)
- b) Other than heat input, state **four** influences the shielding gas can have on the MIG/MAG welding process. (4 marks)
- (Total marks 6)
- 4 a) Produce a sketch of a neutral flame. (3 marks)
- b) On the sketch produced in part a), label **each** of the following features.
- i) Inner cone.
- ii) Outer envelope.
- iii) Hottest point. (3 marks)
- (Total marks 6)
- 5 a) Produce a sketch of a welded Tee fillet joint. (2 marks)
- b) On the sketch produced in part a), label **each** of the following features.
- i) Leg length.
- ii) Weld toes.
- iii) Heat Affected Zone (HAZ).
- iv) Throat. (4 marks)
- (Total marks 6)
- 6 a) Draw the welding symbol for **each** of the following, including arrow and reference line.
- i) Single Vee butt, concave profile.
- ii) Single fillet on other side of joint. (4 marks)
- b) Produce a sketch of **each** of the following types of joint.
- i) Lap.
- ii) Corner. (2 marks)
- (Total marks 6)
- 7 a) With the aid of a sketch, identify a weld preparation suitable for a butt weld in 20 mm thick plate. (2 marks)
- b) State **two** benefits of the preparation selected in part a). (2 marks)
- (Total marks 4)
- 8 With reference to resistance spot welding.
- a) Produce a labelled sketch of the process. (2 marks)
- b) Describe in detail how the heat for welding is generated. (3 marks)
- (Total marks 5)

- 9 a) Produce a cross-sectional sketch of a single Vee butt weld. (1 mark)
 b) On the sketch produced in part a), indicate **each** of the following.
 i) Grain shape within the cooled welded section.
 ii) Grain growth zone. (3 marks)
 iii) Refined zone. (1 mark)
 c) State the type of grain found within the welded section. (Total marks 5)
- 10 a) Describe **one** cause of distortion in a welded joint. (2 marks)
 b) With the aid of a sketch, describe the pre-setting of a Vee butt joint to control distortion. (2 marks)
 c) State **one** other method of controlling distortion when welding a Vee butt joint. (1 mark)
 (Total marks 5)
- 11 a) State **three** types of weld defect. (3 marks)
 b) For **two** of the defects identified in part a), state **one** cause. (2 marks)
 (Total marks 5)
- 12 With reference to the magnetic particle inspection of a welded joint.
 a) Produce a labelled sketch of the use of a magnetic yoke. (3 marks)
 b) Describe how the process shows defects. (2 marks)
 (Total marks 5)
- 13 a) Describe the macroscopic testing of a welded joint. (2 marks)
 b) State **three** other methods of workshop testing welds. (3 marks)
 (Total marks 5)
- 14 a) Show, by means of a sketch, **each** of the following material forms of supply.
 i) Unequal leg angle section.
 ii) Rectangular Hollow Section (RHS). (2 marks)
 b) State **two** types of non-ferrous materials used in fabrication. (2 marks)
 c) State the metal used to form the coating on galvanised steel. (1 mark)
 (Total marks 5)
- 15 a) With reference to selection of low-carbon steel for the manufacture of bridges, state
 i) **two** advantages of its use (2 marks)
 ii) **one** disadvantage of its use. (1 mark)
 b) State **two** reasons for using galvanised steel. (2 marks)
 (Total marks 5)
- 16 a) State **three** criteria that should be considered when selecting aluminium alloy for a fabricated product. (3 marks)
 b) With reference to the production of an acid storage tank, state
 i) **one** suitable metal for its manufacture (1 mark)
 ii) **three** reasons for the selection of this metal. (3 marks)
 c) State **three** heat treatment processes that can be applied to carbon steel. (3 marks)
 (Total marks 10)
- 17 a) State why it is necessary to pre-set plates prior to rolling. (1 mark)
 b) With the aid of a sketch, describe how the length of pre-setting is calculated. (2 marks)
 c) Describe **one** method of producing the pre-set on plates prior to rolling. (2 marks)
 (Total marks 5)

18 Showing **all** workings, calculate the blank length required for the bracket shown in Figure 1.

(5 marks)
(Total marks 5)

(Neutral line = 0.5 t

Bend allowance (BA) formula: $BA = 0.01745 \times R \times \theta$

R = neutral radius at centreline

θ = angle of bend.)

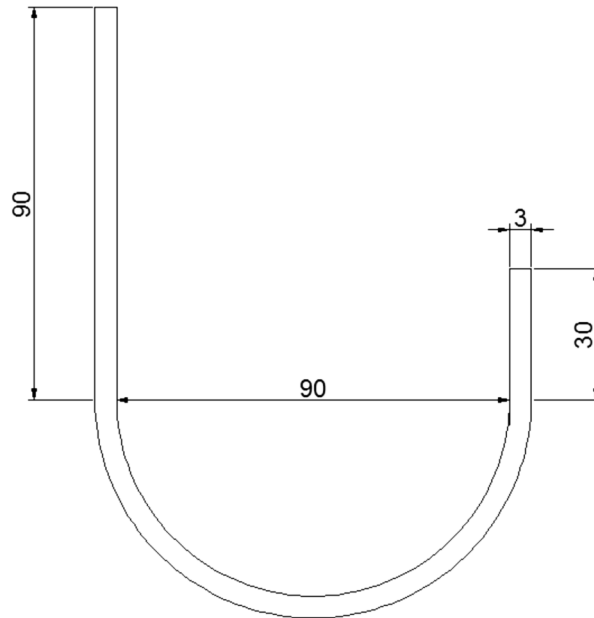


Figure 1