



University of Ruhuna- Faculty of Technology
Bachelor of Engineering Technology Honours
Level 3 (Semester 1) Examination, January 2021

Course Unit: ENT 3172 Welding Techniques

Duration: 3 hours

Instructions to Candidates

- This paper contains 5 questions on 4 pages.
- The examination accounts for 50% of the module assessment.
- This is a closed book examination.
- Answer all questions.
- All questions carry equal marks. The maximum marks attainable for the parts of the questions are indicated in brackets.
- Electronic/communication devices are not permitted. Only allowed is a calculator approved by the Faculty of Technology.

1. A Manufacturing industry can be defined as any industry that makes products from raw materials manually or using machinery.

a) Draw the flow diagram of the manufacturing engineering process.

(05 marks)

b) List four (4) most widely available welding joints with neat sketches.

(04 marks)

c) Briefly discuss the limitations associated with vertical welding position and overhead welding position with suitable sketches.

(05 marks)

d) Briefly explain following welding defects with neat sketches.

- I. Lack of fusion
- II. Porosity
- III. Weld cracks

(06 marks)

2. Welding is a process for joining two similar or dissimilar metals by fusion. It joins different metals/alloys, with or without the application of pressure and filler materials.

a) Write down two examples for each of the following welding types.

- I. Solid State Welding
- II. Fusion Welding
- III. Resistance Welding
- IV. Consumable Electrode Arc Welding

(4 marks)

b) Write down four (4) main reasons of application of welding flux.

(4 marks)

c) Briefly explain two (2) key advantages of resistance welding process with respect to the other welding processes.

(4 marks)

d) What are the three (3) types of oxy-acetylene welding flames? Briefly discuss them in terms of followings,

- Composition of gas mixture
- Flame features
- Applications

(8 marks)

3. Arc welding is one of widely used welding process where an electric arc is used to supply heat for melting the surfaces of the parent metal and also the filler metal.

a) Identify the correct consumable electrode arc welding techniques for each of the following descriptions.

- I. Covering the metal electrodes with a chemical powder
- II. Covering the arc and weld pool with an inert gas
- III. Covering the arc and weld pool with a chemical powder

(3 marks)

b) Briefly explain the stick welding process and outline its advantages and limitations.

(4 marks)

c) Briefly discuss the working principle of electron beam welding with a suitable sketch.

(5 marks)

d) Identify the most suitable solid state welding process for following applications.

- I. Remote joining in hazardous environments
- II. Welding of medical equipment
- III. Welding of thermoplastic materials
- IV. Welding of two wrought iron pieces

(8 marks)

4. Material testing can be divided into two main categories as Destructive testing and Non-Destructive testing.

a) Compare and contrast Destructive testing and Non-Destructive testing.

(04 marks)

b) Select the best Non-Destructive testing method for each of the following applications.

- I. Identify surface defects in plastic gear
- II. Measure the paint coating thickness of a steel bar
- III. Identify an internal weld defect and its size of a pipeline
- IV. Identify an internal defect located in a piston head

(04 marks)

c) Briefly explain the procedure of magnetic particle testing.

(06 marks)

d) Briefly discuss the ultrasound testing mentioning its merits, demerits, and applications.

(06 marks)

3. Arc welding is one of widely used welding process when an electric arc is used to supply heat for melting the surfaces of the parent metal and also the filler metal.

5. Safety is a critical consideration for any welding process. Depend on the type of welding technique there are various kind of safety precautions available.

a) Write down four (4) types of key weld hazards. (04 marks)

b) Write down four (4) personnel protective equipment those are used during gas welding process. (04 marks)

c) Briefly explain short term and long-term health effects of exposure to fumes, gases, and smoke during welding. (06 marks)

d) Briefly discuss three safety rules those should be followed during arc welding process. (06 marks)

4. Material testing can be divided into two main categories as Destructive testing and Non-Destructive testing.

a) Compare and contrast Destructive testing and Non-Destructive testing. (04 marks)

b) Select the best Non-Destructive testing method for each of the following applications:
I. Identify surface defects in plastic gear
II. Measure the paint coating thickness of a steel bar
III. Identify an internal weld defect and its size of a pipeline
IV. Identify an internal defect located in a piston head (04 marks)

c) Briefly explain the procedure of magnetic particle testing. (06 marks)

d) Briefly discuss the ultrasound testing mentioning its merits, demerits, and applications. (06 marks)