

**UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INDUSTRIAL TECHNOLOGY**

**FINAL EXAMINATION
JANUARY 2016 SEMESTER**

COURSE CODE : JCB 20403
COURSE TITLE : DESTRUCTIVE AND NON-DESTRUCTIVE TESTING
PROGRAMME LEVEL : BACHELOR
DATE : 18 MAY 2016
TIME : 2.30 PM – 5.30 PM
DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

- 1. Please read the instructions given in the question paper CAREFULLY.**
 - 2. This question paper is printed on both sides of the paper.**
 - 3. This question paper consists of ONE (1) section.**
 - 4. Choose FOUR (4) questions only.**
 - 5. Please write your answers on the answer booklet provided.**
 - 6. Please answer all questions in English only.**
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THERE ARE 4 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

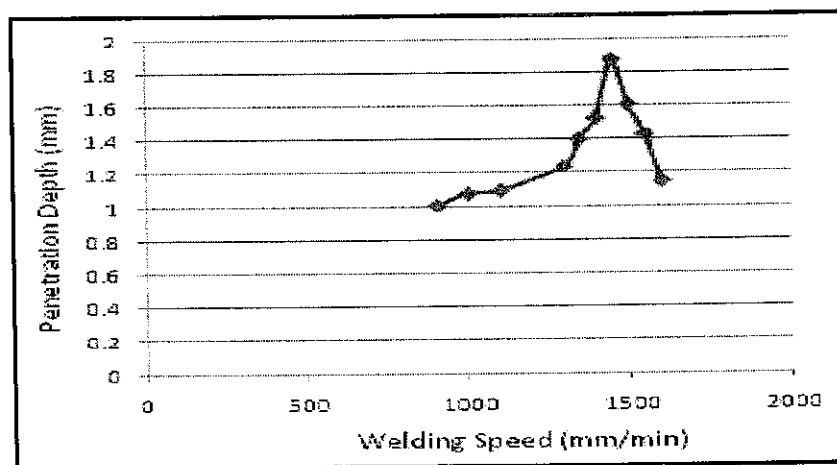
(Total: 100 marks)

INSTRUCTION: Answer only FOUR (4) questions

Please use the answer booklet provided

Question 1

Gas tungsten arc welding is used to joint aluminum alloy 6082 with use of 4043 graded filler wire. The dimension of workpiece is 100 mm long x 40 mm wide x 9 mm thick was prepared and then welded.



Graph 1: Effect of welding speed on depth of penetration

- (a) Graph 1 represents the results of effect of welding speed on the depth of penetration. Interpret the experiment of results based on Graph 1 and show the minimum value for depth of penetration. (7 marks)
- (b) Construct the fusion line crack, center line crack, underfill and excessive reinforcement on the bevel groove butt joint. (6 marks)
- (c) List the instrument that can be used to examine overlap, concave cap, arc strike and start point defect. (4 marks)
- (d) Show the formula of heat input that used to calculate the value of heat input and recommend **THREE (3)** welding process parameters influencing the heat input. (8 marks]

Question 2

Non-destructive testing methods have been used to collect the experimental data. The testing of specimens indicated the presence of defects like toe crack, root crack, face undercut, root undercut, cluster porosity and center line crack.

- (a) List **THREE (3)** defects can be examine using ultrasonic testing. (6 marks)
- (b) Based on the information above, Identify **THREE (3)** surface defects can be examine using visual inspection. (6 marks)
- (c) Explain the characteristics of fusion welding. (5 marks)
- (d) Construct the weld profile according to the several defects below
- i. Weld metal crack, uneven leg length and toe crack on single U butt joint. (4 marks)
 - ii. Spatter, burn-through and over penetration defect on square butt joint joint. (4 marks)

Question 3

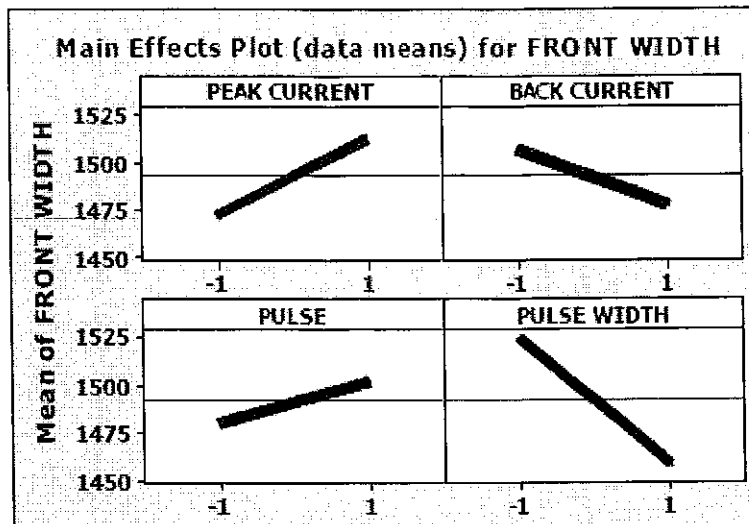
- (a) Prepare and illustrate the procedures of developer dwell time process and post cleaning process in dye penetration process. (10 marks)
- (b) List **SEVEN(7)** types of butt joint (7 marks)
- (c) List **SIX (6)** weld defects can be examine using eddy current testing. (3 marks)
- (d) Construct the working principle of surface cleaning and excess penetrant removal in dye penetration process. (5 marks)

Question 4

- (a) Sketch the working principle of gas metal arc welding. (5 marks)
- (b) Illustrate the equipment and material that used in eddy current testing and ultrasonic testing. (6 marks)
- (c) Decide which type of non-destructive testing that can be used to obtain the information required below:
- i. Inspect rough surface of AA6061 joint. (2 marks)
 - ii. Inspect arc strike defect of AA6061 joint. (2 marks)
 - iii. Measure the weld length of V groove joint. (2 marks)
 - iv. Worm hole on welded joint of AA6061. (2 marks)
- (d) Construct the HAZ crack and root surface crack on the U groove butt joint. (6 marks)

Question 5

After selecting the range of process parameters such as peak current, back current, pulse and pulse width, experiment for joint AA7005 was carried out using arc welding process.



Graph 2: Effect of welding parameter on front width

- (a) Analyze the results based on the Graph 2. (9 marks)
- (b) Compare the differences between groove weld and fillet weld. (9 marks)
- (c) Compare destructive testing and non-destructive testing method. (3 marks)
- (d) Sketch the following welding defects on the double V groove butt joint with dimensions 90 mm x 50 mm x 5mm.
 - i. Root crack (1 marks)
 - ii. Weld metal crack (1 marks)
 - iii. Transverse crack (1 marks)
 - iv. Longitudinal crack (1 marks)

END OF EXAMINATION PAPER

