UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE : FWD 32502
SUBJECT TITLE : WELDING INSPECTION AND TESTING
LEVEL : DIPLOMA
TIME / DURATION : 3.30pm – 6.00pm
                    (2.5 HOURS)
DATE : 09 MAY 2011

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. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This question paper consists of TWO (2) sections, Section A and B. Answer all questions in Section A and TWO (2) questions in Section B.
6. Answer all questions in English.

THERE ARE 17 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.
TION A (Total: 60 marks)

'RUCTION: Answers all question and should be write in the OMR sheet provided in Appendix 1.

Full Radiography is applied to metal with P no. 1 Group No. 1 when the material thickness exceeds

A. 2 inch
B. 1.5 inch
C. 1.25 inch
D. 1 inch

(1 mark)

What is the fluid used in Hydrostatic Leak test

A. Gas
B. Water
C. Oil
D. Foam

(1 mark)

What is the meaning of A-number in ASME IX

A. Represent group of weld deposit
B. Represent group of material
C. Represent group of filler metal
D. Represent group of process

(1 mark)

What is the meaning of P-number in AMSE code and standard

A. Represent group of filler metal
B. Represent group of gas
C. Represent group of process
D. Represent group of material

(1 mark)

What is the difference between SA 36 and A36

A. Tensile strength
B. Yield strength
C. Difference Code and Standard
D. Difference clauses

(1 mark)
6 What is the test pressure of Hydrostatic leak test in metallic piping system.
   A. Not less than 150% times the design pressure
   B. Less than 150% times the design pressure
   C. Not less than 110% times the design pressure
   D. Less than 110% times the design pressure

7 Name the ASME code for qualification of welding procedure
   A. ASME 8
   B. ASME 9
   C. ASME 9
   D. ASME B 31.3

8 What is the meaning of Random Radiography
   A. This applies only to girth weld
   B. This applies only to GMAW-S weld bead
   C. This applies only to girth and miter groove welds
   D. This applies only to welded with porosity

9 How many bend test specimen is needed to qualify a procedure for plate more than 10mm according to ASME 9
   A. 2 side bend test and 2 face bend test
   B. 4 side bend test
   C. 2 side bend test and 2 root bend test
   D. 2 side bend test

10 To what construction does AWS D1.1 applies?
   A. To cover Steel structure construction
   B. To cover pressure piping construction
   C. To cover Pressure Vessel construction
   D. To cover Process piping construction

11 Which code governs procedure qualification for process piping
   A. ASME 8
   B. ASME 9
   C. ASME B 31.3
   D. ASME 2 Part A
12 Name the ASME code for the design of Pressure Piping
   A. ASME 9
   B. ASME B 31
   C. ASME B 31.3
   D. ASME B 31.1 (1 mark)

13 What is the purpose of shielding gas in an arc welding process?
   A. To eliminate hydrogen from the region of the arc
   B. To retard the cooling rate of the weld
   C. To exclude the atmosphere from the region of the arc
   D. All of the above (1 mark)

14 Which of the following will vary the most when varying the arc length using MMA process?
   A. Voltage
   B. Amperage
   C. Polarity
   D. None of the above (1 mark)

15 According to ASME 9 Sec. QW 142, Radiographic examination may be substituted with mechanical testing for groove weld performance qualification, except or one process. What is the process?
   A. GMAW-G
   B. GMAW-P
   C. GMAW-S
   D. FCAW (1 mark)

16 Why is it necessary to carry out a welder qualification test?
   A. To ensure that the welder can weld
   B. To ensure that the welds can withstand extreme stresses
   C. To give maximum confidence that the welder can produce welds that meets the requirements of the approved welding procedure(s)
   D. To make sure that the welder can produce a defect free weld (1 mark)

17 What is the ANSI/ASME dimensional standard for steel flanges and fittings.
   A. B 16.3
   B. B16.5
   C. B16.9
   D. B16.10 (1 mark)
18 What is the actual diameter pipe with NPS 20
A. 18 inches  
B. 20 inches  
C. 40 inches  
D. 60 inches  

19 After flame cut performed on bevels of low-alloy and intermediate-alloy steel what is the next step to do, before proceed to welding
A. approximately 4mm of material shall be removed from the surface  
B. approximately 2mm of material shall be removed from the surface  
C. approximately 1mm of material shall be removed from the surface  
D. no need to remove  

20 Which electrode group does E 6010 fall under
A. Low hydrogen electrode  
B. Minimum tensile  
C. High strength electrode  
D. High impact electrode  

21 What is lamellar tearing?
A. A product defect caused during steel manufacturing  
B. A type of crack which occurs in the parent material due to welding stresses acting in a short transverse direction of the parent material  
C. A type of crack associated with poor through thickness ductility  
D. A type of crack found in welds, which are subjected to cyclic stresses  

22 Why is preheat sometimes carried out on steels?
A. To remove moisture from the weld preparation  
B. To retard the cooling rate of the weld  
C. To aid fusion between weld metal and parent material  
D. All of the above  

23 In a martensite grain structure what would you expect to increase:
A. Ductility  
B. Hardness  
C. Toughness  
D. All of the above
Which of the following is not a type of crack?

A. Fissure
B. Lamellar tear
C. Fish eye
D. Hot tear

Why is welding procedure qualification test necessary?

A. To ensure the welder is able to make sound welds meeting the requirements of the agreed welding procedure
B. To ensure the welder satisfies the NDT and mechanical requirements of the specification
C. To give maximum confidence that the welding variables are compatible and will produce sound welds meeting the requirements of the agreed specification
D. To give a guarantee that a defect free welds are going to be produced

A side bend test, is to test for:

A. Fatigue fracture strength
B. Lack of side wall fusion
C. Toughness value
D. All of the above

Maximum allowable limit for butt welding of piping components with internal misalignment

A. 1.0mm
B. 1.5mm
C. 2.0mm
D. 2.5mm

What is the range of temperature of Carbon steel use for ASME B 31.3

A. Limited to 800°F
B. Over 800°F
C. Limited to 1100°F with reduced allowable stresses
D. Over 1100°F with reduced allowable stresses

What is the preheat temperature for material in P No. 6

A. 400 °F
B. 200 °F - 400 °F
C. 250 °C
D. 200 °C - 400 °C
30. What is the length of reduced section of reduced-section tension specimen according to AWS D1.1

A. Widest face of weld + 1/2" (12mm)
B. Widest face of weld + 1" (25.4mm)
C. Widest face of weld + 1/2" (12mm), minimum 2 1/4" (60mm)
D. Widest face of weld + 1" (25.4mm), minimum 2 1/4" (60mm)  (1 mark)

31. The term of PIPING refer to the .........................

A. overall network of pipes included flange, fitting, valve and other system to convey fluids.
B. The length of pipe all diameter
C. The pipe below NPS 2 inch
D. The pipe above 2 inch.  (1 mark)

32. Pressure tube normally involved with……..

A. internal heat applications as in boiler or superheaters
B. external heat application as in boiler or superheaters.
C. Atmosphere and internal heat application as in boiler or superheaters
D. Atmosphere and external heat application as in boiler or superheters.  (1 mark)

33. The diameter of pressure tube normally produces by measured……..

A. actual inside diameter
B. actual outside diameter
C. actual wall thickness
D. average outside diameter  (1 mark)

34. The pipe indicated with API 5L is normally use for…..

A. high temperature service
B. low temperature service
C. moderate temperature service
D. line pipe for transmission service  (1 mark)

35. What is actual outside diameter of NPS 2

A. 2 inch
B. 25 mm
C. 2.50 inch
D. 2.374 inch  (1 mark)
36. The term of schedule (Sch) was invented to specify...
   A. the outside diameter of pipe
   B. the inside diameter of pipe
   C. the nominal wall thickness of pipe
   D. the average outside diameter

(1 mark)

37. Diameter nominal (DN) calculated in unit of......
   A. centimeter
   B. millimeter
   C. inches
   D. meter

(1 mark)

38. According to ASME B31.3, minimum temperature for pre-heat
temperature recommended for material with P no. 1 with nominal wall
thickness < 25mm is....... 
   A. 10°C
   B. 25°C
   C. 30°C
   D. 60°C

(1 mark)

39. Heat treatment shall be according to....
   A. Material grouping
   B. Thickness range
   C. Material grouping and thickness range
   D. Material grouping, thickness range and batch number

(1 mark)

40. According to ASME B31.3, examinations perform by manufacturer only
cover for..............
   A. girth weld
   B. longitudinal weld
   C. components only
   D. butt weld

(1 mark)

41. What type group of material which can perform by Magnetic Particle
   Examination
   A. SA 106
   B. SA 358
   C. SA 249
   D. SA 213

(1 mark)
42 The permitted misalignment according to ASME B31.3 is.....
   A. 1/32 inches
   B. 1/20 inches
   C. 1/16 inches
   D. 1/8 inches

43 Who is owner's inspector?
   A. manufacturer inspector
   B. erection inspector
   C. fabrication inspector
   D. an employee of the owner

44 The changing of groove design in Welding Procedure Specification (WPS) is categorize as...
   A. Essential variable
   B. Non-essential variable
   C. Supplementary essential variable
   D. Changing with permit

45 How many specimens are needed to qualify Welding Procedure Specification (WPS) for plate less than 8mm?
   A. 2 pieces
   B. 4 pieces
   C. 6 pieces
   D. 8 pieces

46 What is the grouping of electrode with AWS classification E 7018.
   A. F1
   B. F2
   C. F3
   D. F4

47 What is the main purpose of Welding Performance Qualifications.
   A. To qualified the welder
   B. To qualified the welding operator
   C. To qualified the welding procedure
   D. A and B
48 ..........used is to transmit the wave from prob to specimen.

   A. air
   B. couplant
   C. glue
   D. ferrous partical  (1 mark)

49 Dye penetrant examination is very effective to detect ...............  

   A. surface defect
   B. open surface defect
   C. sub surface defect
   D. A, B, and C  (1 mark)

50 Medium for Hydro test  

   A. Oil
   B. Water
   C. Air
   D. Gas  (1 mark)

51 What is PQR (Procedure Qualification Record)  

   A. A record for welder during welding of the test coupon
   B. A record for welding position during the welding of the test coupon
   C. A record of variables recorded during the welding of the test coupon
   D. A record of variables recorded during the welding of the specimen  (1 mark)

52 Which of the following is not on a typical written welding procedure?  

   A. Joint preparation
   B. Amount of stress
   C. Preheat
   D. Consumable filler material  (1 mark)

53 What is the UTS value of a material?  

   A. The fracture point of a material
   B. The fracture point of a material
   C. The proof stress of a material
   D. Both a and b
54 Temp stick is use to .....  
   A. write on specimen  
   B. determine the surface defect  
   C. determine pre-heat temperature  
   D. determine welded temperature  
   (1 mark)

55 Which one is the most dangerous light source.  
   A. Gamma ray  
   B. Ultra violet light  
   C. Infra red light  
   D. Welding arc light  
   (1 mark)

56 What is the value of heat input if the Voltage -18, Amperage – 110 and travel speed (mm) - 1' 30''  
   A. 1.50 kJ/mm  
   B. 1.32 kJ/mm  
   C. 1.40 kJ/mm  
   D. 1.52 kJ/mm  
   (1 mark)

57 Which of the following NDT methods would be the least effective on a butt weld made from austenitic stainless steel  
   A. Dye penetrant  
   B. Radiography  
   C. Ultrasonic  
   D. Magnetic particle  
   (1 mark)

58 Which mechanical test(s) can be used to make an assessment of surface breaking defects  
   A. Bend test  
   B. Nick break test  
   C. Macro test  
   D. All of the above  
   (1 mark)

59 What is the term used to describe the ability of material to be drawn into wire without fracture?  
   A. Plasticity  
   B. Ductility  
   C. Elasticity  
   (1 mark)
D. Malleability

What does the number 70 represent on an E7010 AWS classified electrode?

A. 70 N/mm² minimum UTS  
B. 70 N/mm² minimum impact strength  
C. 70,000 p.s.i. minimum UTS  
D. 70,000 p.s.i. minimum yield strength  

(1 mark)
SECTION B (Total: 40 marks)
INSTRUCTION: Answer TWO questions only.
Please use the answer booklet provided.

Question 1

a. What is the purpose of heat treatment and what is the suitable holding time for material with P number 9A and nominal wall thickness > 19mm? (10 Marks)
b. When the Leak Test is required and what is the pressure limits if a combination of hydrostatic-pneumatic leak test is used. (5 Marks)
c. What is the particular shall be taking into account for each piping system during the test. (5 Marks)

NOTE: All answers to be in accordance with ASME B31.3

Question 2

a. What is the status of Unknown material in construction of boiler piping contains a pressure. (5 Marks)
b. What is the procedure of making Fillet weld and sketch the typical minimum fillet weld for SO and SW components. (10 Marks)
c. Who was performing the inspection jobs. (5 Marks)

NOTE: All answers to be in accordance with ASME B31.1
Question 3

a. When the incomplete filling shall be consider as defects and give another name for incomplete filling. (5 Marks)

b. What is the meaning of repair and list down the procedure to repair a crack area? (10 Marks)

c. List down the requirements of bend test for butt weld. (5 Marks)

*NOTE: All answers to be accordance with API 1104*

Question 4

a. Can the propose PQR be made from the example + PQR 2 + PQR 3 (2 Marks)

b. Considering the individual deposited thickness as per the proposed PQR, give the maximum allowable thickness as allowed by ASME IX. (9 Marks)

c. Can SMAW process be used for proposed PQR, through thickness. (9 Marks)

*NOTE: Refer to appendix 2 attached*
### QW-451.1 GROOVE- WELD TENSION TESTS AND TRANSVERSE-BEND TESTS

<table>
<thead>
<tr>
<th>Thickness T of Test Coupon, Welded, in. (mm)</th>
<th>Range of Thickness T of Base Metal, Qualified, in. (mm) (Notes 1) and (2)</th>
<th>Maximum Thickness t of Deposited Weld Metal, Qualified, in. (mm) (Notes 1) and (2)</th>
<th>Type and Number of Tests Required (Tension and Guided-Bend Test) (Note (2))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1/8 (1.5)</td>
<td>T 2T</td>
<td>2T</td>
<td>2 2 2</td>
</tr>
<tr>
<td>1/3 to 1/8 (1.5 to 20), incl.</td>
<td>1/4 (1.5)</td>
<td>2T</td>
<td>2 Note (3) 2 2</td>
</tr>
<tr>
<td>Over 1/2 (10), but less than 1/2 (19)</td>
<td>3/4 (6)</td>
<td>2T</td>
<td>2 Note (5) 2 2</td>
</tr>
<tr>
<td>1/2 (19) to less than 1/2 (38)</td>
<td>3/4 (6)</td>
<td>2T</td>
<td>2 when r &lt; 1/4 (19) 2 2 Note (4) 4 ...</td>
</tr>
<tr>
<td>1/4 (19) to less than 1/2 (38)</td>
<td>3/4 (6)</td>
<td>2T</td>
<td>2 when r &gt; 1/4 (19) 2 2 Note (4) 4 ...</td>
</tr>
<tr>
<td>1/2 (38) and over</td>
<td>3/4 (6)</td>
<td>2 when r &lt; 1/4 (38) 2 2 when r &gt; 1/4 (38) 2 2 4 4 ...</td>
<td></td>
</tr>
<tr>
<td>1/2 (38) and over</td>
<td>3/4 (6)</td>
<td>2 when r &gt; 1/4 (38) 2 2 4 4 ...</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. The following variables further restrict the limits shown in this table when they are referenced in QW-230 for the process under consideration: QW-403.9, QW-403.10, QW-404.32, and QW-407.4. Also, QW-202.2, QW-202.3, and QW-202.4 provide exemptions that supersede the limits of this table.

2. For combination of welding procedures, see QW-208.4.

3. For the welding processes of QW-403.7 only; otherwise per Note (1) or 2T, or 2T, whichever is applicable.

4. See QW-151.1, QW-151.2, and QW-151.3 for details on multiple specimens when coupon thicknesses are over 1 in. (25 mm).

5. Four side-bend tests may be substituted for the required face- and root-bend tests, when thickness T is 1/4 in. (10 mm) and over.