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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR

MALAYSIA FRANCE INSTITUTE

FINAL EXAMINATION

JULY 2010 SEMESTER

SUBJECT CODE	:	FWD 34502
SUBJECT TITLE	:	BASIC PRESSURE VESSEL DESIGN AND STEEL STRUCTURE
LEVEL	:	DIPLOMA
TIME/DURATION	:	12.30pm – 2.30pm (2 HOURS)
DATE	:	08 NOVEMBER 2010

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. For Section B, answer TWO (2) question only.
6. Answer all questions in English.
7. No graph paper is appended.

THERE ARE 9 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

1. ASME VIII primarily focuses on

   A. Rules on the selection of materials for pressure vessels.

   B. Rules on the construction of pressure vessels.

   C. Rules and regulation on the construction of boilers.

   D. Rules on the construction of tall towers.

(2 marks)

2. All welding shall be done by.

   A. SAW and SMEW.

   B. SMAW and SAW.

   C. SMAW and GTAW.

   D. SMAW and SSAW

(2 marks)

3. Label the TWO (2) types of lifting attachments.

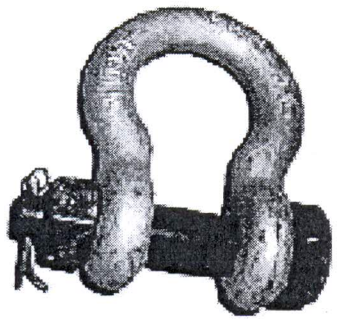


Figure 1

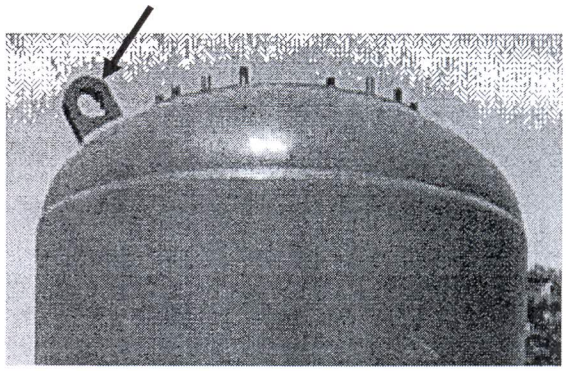


Figure 2

_____ _____

(3 marks)

4. What does ASME II, Part A, B, C and D encompasses on?

A. Selection of material.

B. Standardization on the material.

C. Selection of nozzles and manway.

D. Selection on the stamps.

(2 marks)

5. How would you understand design pressure of pressure vessel?

A. It is the pressure of used gas going out of the pressure vessel.

B. It is the pressure used in the gas regulator.

C. It is the pressure used to allow good gas flow.

D. It is the pressure used in the pressure vessel.

(2 marks)

6. "Relief valve" is an automatic safety device, which of the following are relief devices main functions?

A. Pressure-relieving device to prevent over-pressurization.

B. Pressure-relieving device to prevent under-pressurization.

C. Pressure-relieving device to assist over-pressurization.

D. Pressure-relieving device to assist pressurization.

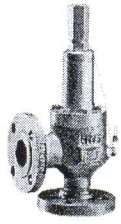


Figure 3 Relief valve

(2 marks)

7. The desired life time of a vessel is an economical question. Design of major vessels and minor vessels are as follows:

A. Major vessels 15 – 20 years and minor vessels 8 – 10 years.

B. Major vessels 20 – 30 years and minor vessels 10 – 15 years.

C. Major vessels 10 – 50 years and minor vessels 12 – 15 years.

D. Major vessels 18 – 40 years and minor vessels 5 – 10 years.

(2 marks)

8. Fill in the joint efficiency, E for the weld joint indicated below.

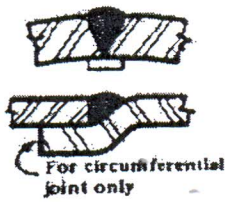
TYPES CODE UW-12		JOINT EFFICIENCY, E When the Joint:		
		a. Fully Radio-graphed	b. Spot Examined	c. Not Examined
1 	Butt joints as attained by double-welding or by other means which will obtain the same quality of deposited weld metal on the inside and outside weld surface. Backing strip if used shall be removed after completion of weld.	.....	.....	.....
2 	Single-welded butt joint with backing strip which remains in place after welding	.....	.....	.....
3 	Single-welded butt joint without use of backing strip	.....	.....	.....

Table 1 Types of welded joint, weld efficiency

(4 marks)

9. How is thin-walled pressure vessel categorized?

A. 1/10 of the external diameter.

B. Circular, triangular or obround.

C. 1/10 of the inner radius.

D. Circular, elliptical or oblong.

(2 marks)

10. A tall tower has to retain certain wind pressure. To do this the thickness of the lower part is thicker than the upper part of the tower. As per referred code, the thicker plate shall be tapered if the difference in thickness is more that /18 inch or one-fourth of the thinner plate. If the lower part is ½ inch thick while the upper part is ¼ inch thick, what is ℓ distance?

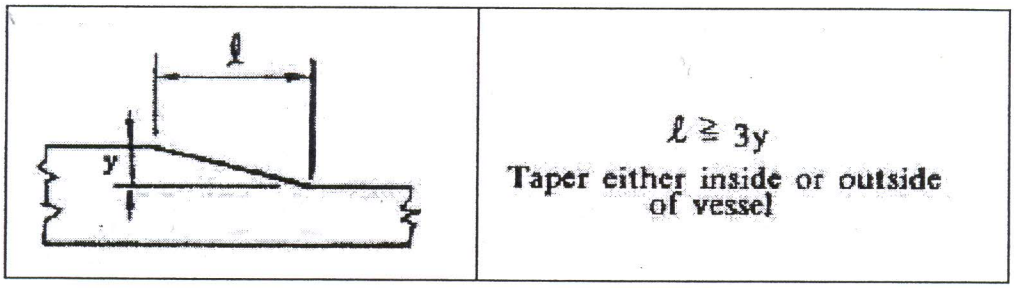


Figure 4 Butt welded joint of plates of unequal thickness

A. ℓ = 1.5 inch

B. ℓ = ½ inch

C. ℓ = ¾ inch

D. ℓ = 1.0 inch

(3 marks)

11. The preservation of a pressure vessel exterior is usually done by

A. painting.

B. embossing.

C. plating.

D. sand-blasting.

(2 marks)

12. The use of only two saddles is preferred because

A. it is static and easier to move.

B. it is statically and ergonomic over other type of supporting system.

C. it is statically and economical over multiple supporting system.

D. it is ergonomic and economical.

(2 marks)

13. The types of preferred opening of pressure vessel are

A. Circular, square and rectangle.

B. Circular, spherical or obround.

C. Circular, elliptical or obround.

D. Circular, round or elliptical.

(2 marks)

14. Before the pressure vessel is ready to be delivered, the manufacturer shall furnish the purchaser with the following documentations.

A. MDR, "as built" shop drawings, copies of hydrostatic test and temperature of PWHT and rubbing of name plate.

B. MDR, "as built" erection drawings, copies of static test and temperature of PWHT and rubbing of plate number.

C. MDT, "as built" detailed drawings, copies of hydrostatic test and temperature of PWHT and rubbing of hot plate.

D. MGR, "as built" shop drawings, copies of hydrographic test and temperature of PWHT and rubbing of test plate.

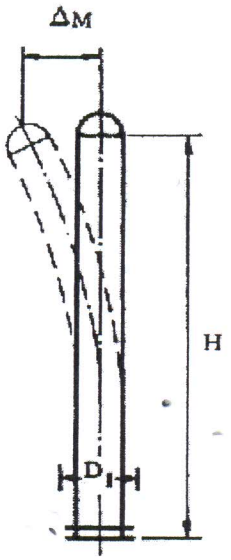
(2 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 1



Formula

$$\Delta_M = \frac{P_w D_1 H(12H)^3}{8EI}$$

NOTATIONS

Δ_M = Maximum deflection (at the top), in.
D_1 = Width of the tower with insulation, etc. ft.
E = Modulus of elasticity, psi
H = Length of vessel, included skirt, ft.
I = $R^3\pi\, t$, moment of inertia for thin cylindrical shell (when $R>10t$)
R = Mean radius of the tower, in.
t = Thickness of skirt, in.
P_w = Wind pressure, psf

Given:

D_1 = 2 ft., 6 in.
E = 30,000,000
H = 48 ft., 0 in.
I = $R^3\ \pi\ 0.3125$
P_w = 30 psf
R = 12 in.
t = 0.3125 in.

a) Determine the maximum deflection: Δ_M **(15 marks)**

b) Determine the maximum allowable deflection 6"/100' of height for a 48' tower. Take 1 inch = 25.4mm and convert your answer to mm with one decimal place.

(15 marks)

Question 2

1. List down the FIVE (5) design considerations.

(7 marks)

2. Pressure relief devices or safety valve is a must in terms of design consideration. State its main purpose of installation.

(8 marks)

3. Under the description of Maximum Allowable Working Pressure, the internal pressure at which it weakest element of the vessel is loaded to the ultimate permissible point. What are the assumptions to it allowances.

(15 marks)

Question 3

1. Tall towers design considers stress conditions. List the FOUR (4) locations where the stresses can be calculated.

(10 marks)

2. The height of tall towers depends greatly on its functions. Loadings such as wind and earthquakes are also included when necessary. Explain why with different height stages different plate thicknesses are utilizes.

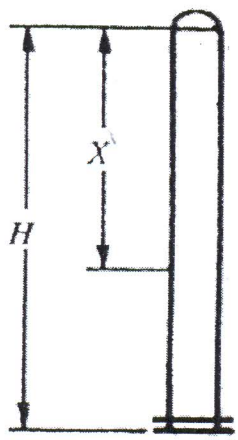
(10 marks)

3. The bending moment due to wind is decreasing from the bottom to the top of the tower, thus the plate thickness can also be decreased accordingly. Table A is a convenient aid to find the distance down from the top tower for which a certain thickness is adequate.

t_w/t_p	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7
m	1.0	0.91	0.84	0.79	0.74	0.71	0.67	0.64	0.62	0.6	0.58	0.56	0.54
t_w/t_p	1.8	1.9	2	2.2	2.4	2.6	2.8	3.0	3.3	3.6	4.0	4.5	5.0
m	0.53	0.51	0.5	0.48	0.46	0.44	0.42	0.41	0.39	0.37	0.35	0.33	0.32

Table A, VALUES OF FACTOR, m

From Table A, using factor m can be found the distance X down from the top tangent line within which the thickness calculation for internal pressure satisfactory also to resist the wind pressure.



X	=	H x *m*
t_p	=	Hoop tension (in)
t_w	=	the required thickness for wind pressure at the bottom head joint to shell, in.
t_p	=	0.233 in., t_w = 0.644 in.
H	=	100 ft.

Find X

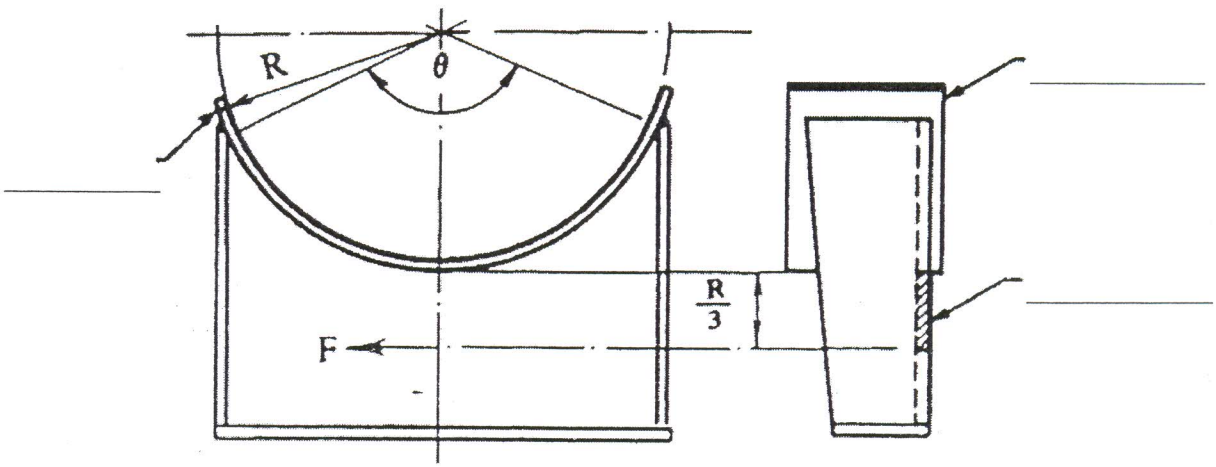
(10 marks)

Question 4

1. Horizontal vessels supported by saddles are subjected to different types of stresses. Name the THREE (3) types of stresses.

(12 marks)

2. With the given diagram of design of saddles label the necessary parts. Joining is made possible by the following three and only three fundamental forces:



(6 marks)

3. The expansion and contraction of horizontal vessels supported by saddles must be allowed to move.
State the type of bolts needed to use.

When should the slide bearing be used?

How should concrete saddles be considered?

(12 marks)

END OF QUESTION