Universiti Tun Hussein Onn Malaysia

VERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

E NAME	:	PIPING ENGINEERING
E CODE	:	BNL 30403
AMME CODE	:	BNL
NATION DATE	:	JUNE / JULY 2019
ION	:	2 HOURS AND 30 MINUTES
JCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Steel pipes are long, hollow tubes that are used for a variety of purposes. The first methods for producing steel pipe were introduced in the early 1800s, and they have steadily evolved into the modern processes we use today. In your own words, describe the working principle of open-hearth furnace and electric arc furnace.

(8 marks)

(b) Iron and iron based alloy consists of two units cell forms structures which are body-centered cubic (BCC) and faced centered cubic (FCC). Sketch both structures and draw the position of atoms in the crystal structure.

(7 marks)

(c) Piping engineers apply the principles of mathematics, physics and chemistry to assure the design of pipe systems used to convey liquid or gas from one location to another. List another specific task for piping engineering.

(5 marks)

Q2 (a) Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. Interpret the properties of conducting *radiographic* and *liquid penetration* examination.

(8 marks)

(b) A cast iron pipe is to carry 60 m^3 of compressed air per minute at a pressure of 1 N/mm^2. The velocity of the air in the pipe is limited to 10 m/s and the permissible tensile stress for the material of the pipe is 14 MPa. Determine the diameter of the pipe and its wall thickness in millimeter (mm) unit.

(5 marks)

(c) In steels and cast irons, the microstructural constituents have several names such as ferrite, pearlite, bainite, martensite, cementite, and austenite. All of the microstructural have their own properties with different percentage of carbon. Explain the properties *pearlite* and *martensite* with structural shapes.

(7 marks)

Q3 (a) Rotary tube piercing, also called roll piercing process, is a hot forming process that can manufacture long lengths of seamless tube and pipe. Through the process, compressive forces will be applied to a cylinder that create internal stresses at the center.

(i) Explain in details the roll piercing process.

(4 marks)

(ii) Sketch the component involves in the process.

(3 marks)

(b) An ultrasonic transducer was attached in the pipeline for mechanical diagnosis oscillatesat a frequency of 6.7 MHz.

(i) Determine the osciallation time.

(3 marks)

(ii) Determine the angular frequency.

(6 marks)

(c) The internal diameter of the galvanized iron pipe is 350 mm while the thickness is 48.5mm under pressure of 5 N/mm^2 shown in **Figure 3(c)**. This pipe is used to carry out waste water from the industrial site to water treatment plantation. Calculate the tangential stress at the inner, middle (radius = 225 mm) and outer (radius = 175 mm).

(7 marks)

Q4 (a) Explosion is generally defined as the resulting burst of the containing tank, vessel or pipe. Usually, the explosion are being prevented by the usage of mitigation devices. Explain the usage of flame arrester in handling explotion in ventilation.

(5 marks)

(b) The maximum distance a flame may travel to exit is from the bottom of the sugar silo to the top (6m) shown in **Figure 4(b)**. However, the flame does not spread in an optimum fashion in a cone and allows just one third of the cone height to be used instead. Calculate the length to diameter (L/D) ratio.

(10 marks)

(c) The family of documents that govern design and construction of pressure piping is the ASME B31 pressure piping code and its refer to piping system above 15 psig above atmospheric pressure. Discuss the documents in ASME B31.2: Fuel Gas Piping.

(5 marks)

Q5 (a) In piping, traps are one of the important components used to support the functional of the piping system to be more efficient. Briefly explain the functions of traps and give **THREE (3)** example of traps usually used in piping system.

(5 marks)

(b) Water at 15°C flows through a 25cm diameter riveted steel pipe of length 450m and roughness ε = 3.2mm. The head loss is known to be 7.30m. Determine the Reynold number and relative roughness of the water flow in the steel pipe. Given that the volumetric flow rate, V is 1.39 m/s.

(10 marks)

(c) The sensitive leak test technique consists in detecting leakage of a tracer gas, such as Helium into or out of the tested system. It consists of several components and detector probe in the system. Illustrate the arrangement of the components and probe for the sensitive leak test.

(5 marks)

- END OF QUESTONS –

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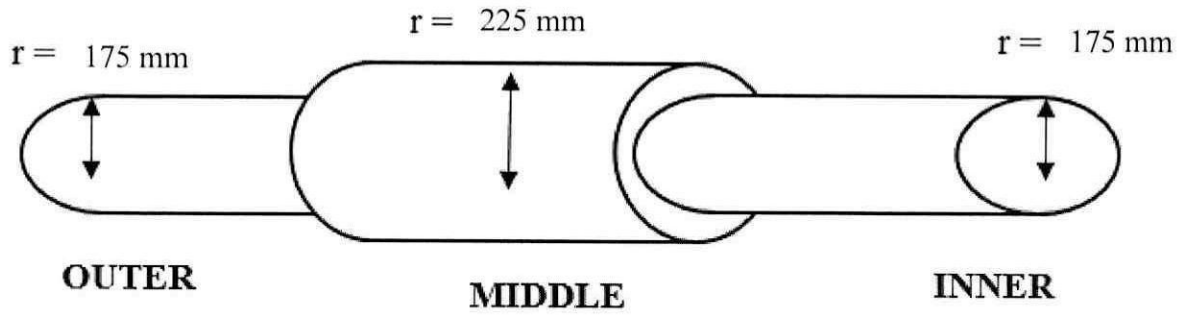

Figure 3(c)

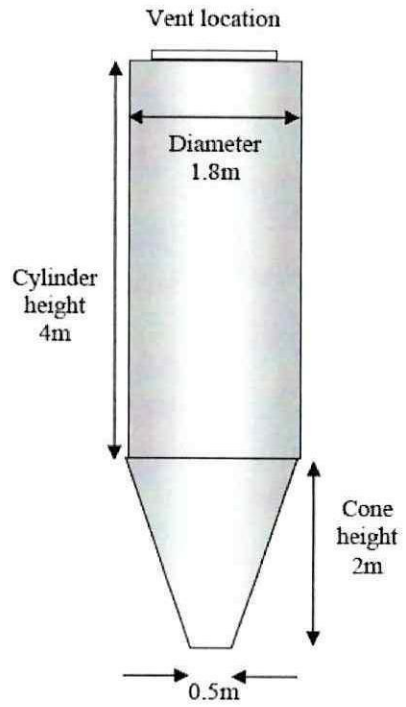

Figure 4(b)