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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2015/2016**

COURSE NAME : BIOPRODUCT FACILITY DESIGN  
COURSE CODE : BNN 40104  
PROGRAMME CODE : BNN  
EXAMINATION DATE : JUNE / JULY 2016  
DURATION : 3 HOURS  
INSTRUCTION : ANSWERS **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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- Q1** Commissioning involves testing equipments, facilities and plants prior to commercial production. This step is extremely crucial to ensure that the equipments, facilities and plant are functioning correctly and most importantly, be able to produce the expected results. Additionally, the plant must meet the clients' requirements and performance specifications as they are the main contributors for the whole plant.
- (a) List **FIVE (5)** key elements for a successful plant commissioning.  
(5 marks)
- (b) As the head of commissioning engineer, you are responsible on the preparation and planning of a plant start-up. Based on the elements that you have stated in **Q1(a)**, plan the activities that you and your team will conduct for a successful start-up of the bioproduct plant.  
(20 marks)
- Q2** (a) One of the activities for commissioning is to perform piping and vessels flushing and cleaning. During this process, any loose foreign substance and production residues are removed to avoid line blockage and damage to sensitive components of the plants.
- (i) Identify **FOUR (4)** commonly-used cleaning methods.  
(2 marks)
- (ii) Explain briefly and provide **ONE (1)** example of possible equipment or component associated with each of the method stated in **Q2(a)(i)**.  
(8 marks)
- (b) An instrument is a device that measures and controls any changes in process variables such as temperature, pressure and flow.
- (i) Illustrate the basic process control loop.  
(4 marks)
- (ii) Differentiate between *feedback control* and *feedforward control*.  
(4 marks)
- (iii) **Figure Q2(b)** shows a boiler drum which produces steam for downstream bioprocessing units. Propose separate *feedback control* and *feedforward control* for the system (use suitable symbols that are provided **ONLY**).  
(7 marks)

**Q3** Plant or equipment shutdown initiated by an input to the control system (manual pushbutton) or by a logic action (interlock) within the control system.

(a) Describe the term ‘trip’ and give an example of a situation that can cause trip in a bioproduct plant.

(3 marks)

(b) Assess the significance of interlock system and demonstrate an example of interlock system that is used in a bioproduct plant.

(5 marks)

(c) As an engineering technologist in a bioproduct plant, you are required to inspect the plant condition for start-up. Organize a schedule of inspection for boiler, turbine and generator respectively.

(9 marks)

(d) Pressure relieving valves are usually used throughout the thermal power generating industry. Evaluate **TWO (2)** significance of pressure relieving valves that are used in a bioproduct plant.

(2 marks)

(e) Differentiate the types of pressure relieving valves:

- (i) Safety valve
- (ii) Safety relieve valve
- (iii) Power operated pressure relieving valve

(6 marks)

**Q4** Detecting leaking of steam, water or different types of gases is a major concern at a bioproduct plant.

- (a) As an engineering technologist in a bioproduct plant,
- (i) Explain why the gas leak is relevant to be detected.
  - (ii) Propose when it is relevant to detect the leaking.

(4 marks)

- (b) Explain in detail about the important parameters that an engineering technologist has to know in a gas leak detection situation:
- (i) Lower Explosive Level (% LEL)
  - (ii) Leak rate (kg/s)
- (4 marks)
- (c) Differentiate between *infrared thermography* and *ultrasonic acoustic* methods for leaking detection in a bioproduct plant.
- (6 marks)
- (d) As an engineering technologist in a bioproduct plant, arrange **THREE (3)** methods other than infrared thermography and ultrasonic acoustic for leaking detection in a bioproduct plant.
- (6 marks)
- (e) Describe the objective of pressure testing during start-up.
- (1 mark)
- (f) Propose a schedule for pressure testing in bioproduct plant.
- (4 marks)

**Q5** Imagine that you have started working as an engineering technologist at the Yakult (Malaysia) Sdn. Bhd. in Shah Alam, Selangor.

- (a) Assess the purpose of risk management for the industry.
- (2 marks)
- (b) Sketch and explain **FOUR (4)** steps in controlling hazards and risks for the industry.
- (8 marks)
- (c) Prepare a table of hazard identification and risk assessment including the controls determination for the industry.
- (7 marks)
- (d) Describe **TWO (2)** objectives of the Safe Permit to Work system.
- (2 marks)

- (e) Identify and describe **THREE (3)** examples of tasks requiring permits to work.

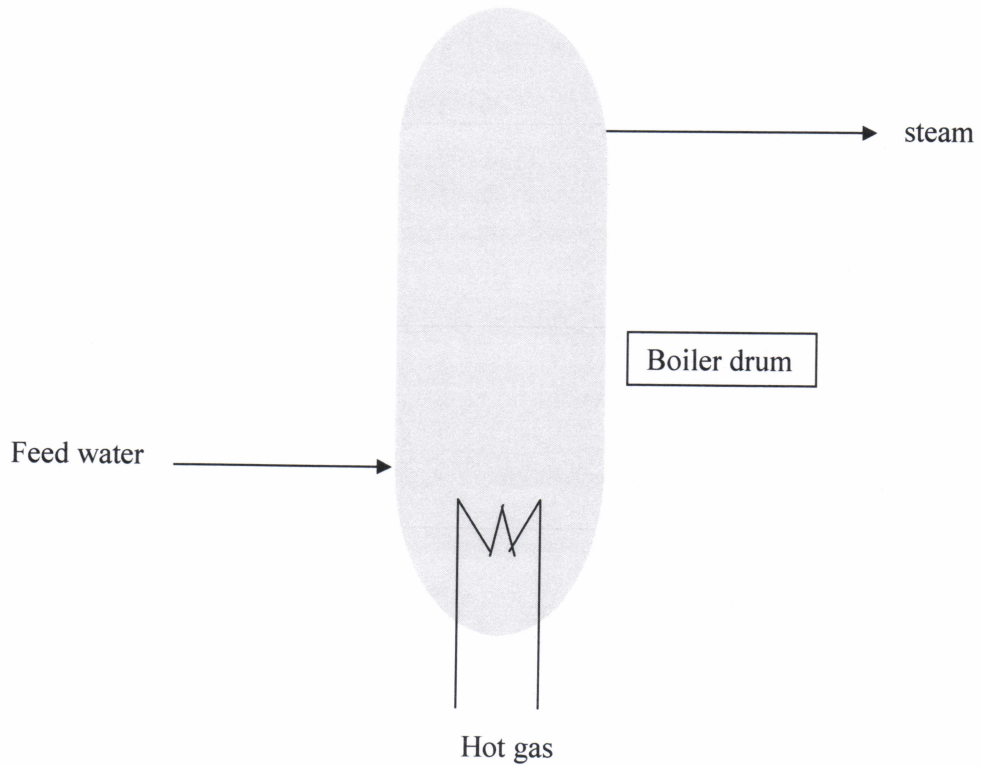
(6 marks)

**-END OF QUESTIONS -**

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**Figure Q2(b)**



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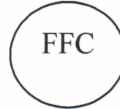
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Symbols



Level Controller



Feedforward Controller



Level Transmitter



Flow Indicator



Level Indicator



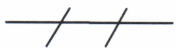
Flow Controller



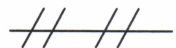
Connection to process / instrument supply



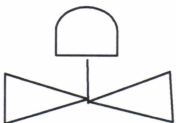
Electric signal



Undefined signal



Pneumatic signal



Valve

UNIVERSITY OF  
SOUTH ALABAMA  
SCHOOL OF ENGINEERING  
BIRMINGHAM, ALABAMA 35288-0202  
www.usouthal.edu