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Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2016/2017**

**COURSE NAME** : INTRODUCTION TO CHEMICAL  
ENGINEERING TECHNOLOGY

**COURSE CODE** : BNQ 10103

**PROGRAMME CODE** : BNN

**EXAMINATION DATE** : JUNE 2017

**DURATION** : 3 HOURS

**INSTRUCTION** : ANSWERS ALL QUESTIONS

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

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MORNING  
14  
UNIVERSITI TUN HUSSEIN ONN MALAYSIA  
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80100 SKUDAI, JOHORE BAHRU

**Q1** Engineering and engineering technology are separate but closely related professional areas that differ in curricular focus and career paths.

- (a) Carry out **SIX (6)** advantages of “Chemical engineering technology” program in comparison to “Chemical engineering” program. (6 marks)
- (b) As an engineering technologist at a chemical/biochemical plant, you are required to decide a suitable process for the chemical/biochemical production. Explain in detail the differences between “batch process” and “continuous process” by giving appropriate examples. (6 marks)
- (c) Explain the following contributions which have been made by chemical engineering technologists to the society:
- (i) Fueling the world’s economies
  - (ii) Creating cleaner energy
  - (iii) Better living through chemistry
  - (iv) Products for growing populations

(8 marks)

**Q2** A dimension is a fundamental quantity, a property of physical entity, while a unit is a specific magnitude of a dimension, either base or derived.

- (a) Assess **TWO (2)** importance of units and conversions. (2 marks)
- (b) Demonstrate an example of incident that occur due to failure of units and conversions. (3 marks)
- (c) Describe the term “empirical formula” and “molecular formula”. Provide an example for each formula. (4 marks)
- (d) Explain the term “molarity” and “normality”. (4 marks)
- (e) Evaluate normality of following conditions:
- (i) Acid reaction for sulfuric acid
  - (ii) Nitrate precipitation reaction for Nitric acid
  - (iii) Aluminium reaction for  $\text{Al}_2(\text{SO}_4)_3$
  - (iv) Nitrate precipitation reaction for  $\text{Zn}(\text{NO}_3)_2$

(4 marks)

- (f) Calculate the mole of ammonia and carbon dioxide required to produce 235 grams of urea. [N:14, H:1, C:12, O:16].  
$$\text{NH}_3(\text{g}) + \text{CO}_2(\text{g}) \rightarrow (\text{NH}_2)_2\text{CO}(\text{aq}) + \text{H}_2\text{O}(\text{l})$$

(3 marks)

**Q3** Balanced equations for chemical reactions provide data for chemists and chemistry students to calculate various amounts of reactants and products.

- (a) Show the general balance equation for material balances. (1 marks)
- (b) According to **Figure Q3(b)**, a mixture containing Y and 63% Z by mass is fed to a distillation column. 89% of the Y in the feed is produced in overhead stream and 3266 kg/h of product leaves in the bottom stream. Calculate all flows and compositions. (11 marks)
- (c) Carry out **THREE (3)** major types of chemical process flow sheets. (6 marks)
- (d) Differentiate between “steady state” and “unsteady state process”. (2 marks)

**Q4** Chemical natural resources are those material and substances, which occur naturally in the environment. They are those resources that are readily and naturally available on our planet, and can be used in their natural and undisturbed form.

- (a) Classify the following classification of natural resources:
- (i) Source of origin
  - (ii) Renewability
- (6 marks)
- (b) Differentiate between the terms “Biotechnology” and “Bioremediation”. (4 marks)
- (c) Demonstrate an example of biotechnology applications in the following category:
- (i) Medical and health industry
  - (ii) Agricultural industry
  - (iii) Bioprocessing
- (6 marks)
- (d) Explain how bioproduct development can minimize the environmental problems such as global warming and flooding. (4 marks)

**Q5** Safety and health in chemical process industry and ethical issues are very important for the safety of workers and employers.

- (a) Explain **FOUR (4)** objectives of industrial safety and health. (4 marks)
- (b) Define the term “risk assessment”. (2 marks)
- (c) Explain **THREE (3)** importance of risk assessment. (3 marks)
- (d) Demonstrate typical techniques used in **FOUR (4)** major approaches to inherent safety. (8 marks)
- (e) A process has reported fatal accident rate (FAR) of 4. If an employee standard working hours is 8 hr per shift for 300 days per year, calculate the deaths per person per year. (3 marks)

- END OF QUESTIONS -

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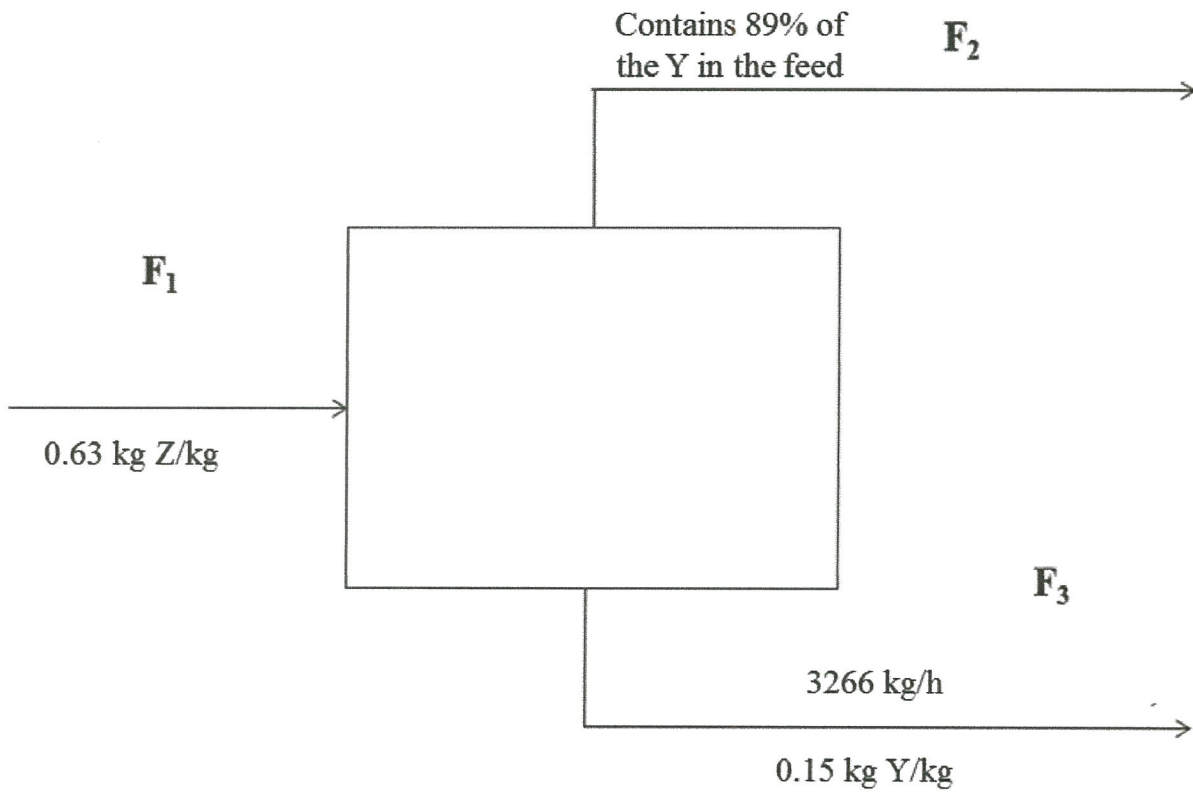


Figure Q3(b)