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**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

**COURSE NAME : PLANT DESIGN AND PROCESS**  
**COURSE CODE : DAK 21003**  
**PROGRAMME : 2 DAK**  
**EXAMINATION DATE : DECEMBER 2015/ JANUARY 2016**  
**DURATION : 2 HOURS 30 MINUTES**  
**INSTRUCTION : SECTION A) ANSWER ALL  
QUESTIONS**  
**SECTION B) ANSWER TWO (2)  
QUESTIONS ONLY**

**THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES**

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### SECTION A

- Q1**
- (a) Sketch a simple Process Flow Diagram (PFD) with percentage assumption based on your design plant (minimum 5 operation tank/ process).  
(10 marks)
  - (b) Sketch **two (2)** equipment with automatic level and temperature controller based on your design plant.  
(5 marks)
  - (c) Show calculation to obtain total initial raw material when target product needed is 1,000 tonne per batch.  
(10 marks)
- Q2**
- (a) Using your own word, describe capital cost estimation based on following;
    - (i) Effect of Capacity  
(5 marks)
    - (ii) Effect of Time  
(5 marks)
  - (b) (i) Define meaning of contingency in plant costing estimation.  
(2 marks)
  - (ii) Point out the importance of contingency to be included in plant costing estimation.  
(2 marks)
  - (c) Describe the meaning of inflation and give relevant example.  
(5 marks)
  - (d) Describe the meaning of capital cost.  
(3 marks)
  - (e) Describe the term payback period.  
(3 marks)

**SECTION B**

- Q3** (a) Analyze in detail all factors that influence site selection of your plant. (15 marks)
- (b) Write the advantages and disadvantages of your raw material used in your plant compared to other raw material. (10 marks)
- Q4** (a) Discuss plastic as a material of construction. (4 marks)
- (b) Describe type of plastic. (5 marks)
- (c) The equipment used in the chemical processes industries can be divided into two classes which are proprietary and non-proprietary. Distinguish this two classes by giving suitable example. (8 marks)
- (d) Sketch the operation of magnetic and electrostatics separator. (8 marks)
- Q5** (a) Define Piping and Instrumentation Diagram (P & ID). (5 marks)
- (b) Compare function of Piping and Instrumentation Diagram and Process Flow Diagram. (14 marks)
- (c) Describe how to read P & IDs based on first letter, succeeding letters and connecting line. (6 marks)

**Q6** Production plant of lactic acid normally contains raw material tank, fermenter, centrifuge, evaporator and storage tank. In general, production of lactic acid able to convert 90% of raw material to lactic acid solution. This lactic acid solution contain solid which then will be separated using centrifuge. 15% solid will be discarded during this process. Lactic acid solution then will undergo evaporation which removes another 25% of water. The remaining lactic acid will be stored in storage tank. This process complete in 24 hours and production plant is open for 350 days per year.

(a) Solve the total amount of raw material per day needed to produce 100,000 tons/year lactic acid using backward calculation based on assumption given in question.

(15 marks)

(b) Sketch the lactic acid production until downstream processing flow work with appropriate stream line value using the value given in question.

(10 marks)

**- END OF QUESTION -**