

*King Fahd University of Petroleum & Minerals*  
Chemical Engineering Department

**CHE 425 - Engineering Economics and Design Principles**

**(Term 081)**  
**1<sup>st</sup> Major Exam.**

Name \_\_\_\_\_

ID # \_\_\_\_\_

Time allowed: **100 minutes**

Instructor: Dr. Nadhir A. Al-Baghli

<b>Question #</b>	<b>Max. Numbers</b>	<b>Obtained</b>
<b>1</b>	<b>30</b>	
<b>2</b>	<b>30</b>	
<b>3</b>	<b>10</b>	
<b>4</b>	<b>10</b>	
<b>5</b>	<b>20</b>	
<b>Total</b>	<b>100</b>	

**November 24, 2008**

**Q1 (30 points)**

**Define the following terms**

Process flow diagram

Process topology

Plot plans and elevation diagrams

Overall Conversion

Profit Margin

Adiabatic Mixer

Reactant primary flow path

Heuristics

Utility

Product Specification



- d) What are the major steps that should be decided when a new process is constructed?
- e) Name and discuss three factors that should be considered when deciding between batch and continuous process.
- f) Name at least three items related to the process reactions that should be considered in the early design of the reactor block.

**Q3 (10 points)**

**Explain the meaning of the following symbols**

1) mps

2) fg

3) cw

4) TIC

5) C-203 A/B

6) P-304 A/B

7) V-101

8) LAH

9) LCV

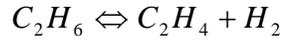
10) PY

**Q4 (10 points)**

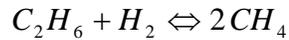
How many distillation columns are usually required to purify a stream containing three components into three pure products? Sketch two possible sequences (configurations) and state below each sketch the possible reasons to select that sequence.

**Q5 (20 points)**

Ethylene is produced via the thermal cracking of ethane according to the reaction:



The following undesired reaction also takes place



Steam is continuously injected with the feed to prevent severe cracking of the hydrocarbons. The single pass conversion is 80 % and the selectivity is 90 %. The reactions take place at low pressure and extremely high temperature. Ethylene is produced at a rate of 500,000 kg/day.

- a) Construct a simple input-output diagram for the above process.
- b) Construct a simple BFD for the process.
- c) Calculate the profit margin of the process.

<b>Component</b>	<b>MW</b>	<b>Price (\$/kg)</b>
C <sub>2</sub> H <sub>6</sub>	30	0.30
C <sub>2</sub> H <sub>4</sub>	28	0.60
CH <sub>4</sub>	16	0.30
H <sub>2</sub>	2	0.70