

2011 National Exams

04-Chem-A5  
Chemical Plant Design and Economics

3 Hours Duration

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Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper a clear statement of the assumptions made.
2. Any non-communicating calculator is allowed. This is an OPEN BOOK exam.
3. The questions are of equal value. The candidate will answer any five of the seven questions. Only five questions that you answer will be marked.
4. Most questions require an answer in essay format. Clarity and organization of the answer are important

**1) Process Development (20 marks)**

**The organization that you work for has expressed an interest in producing a particular product. While it is obvious that the design of the process is very important there are many other aspects that are just as important. Many of these issues must be looked at prior to the actual design process and again many affect the process itself. Discuss several issues that must be considered.**

**2) Types of process designs (20 marks)**

**During the overall design process there are some five different designs carried out. Identify these five and give a short description of what is involved in the particular design being considered and its potential effect on the overall design process. Economic issues are usually most important here.**

**3) Business Economics (20 marks)**

**Companies are in business to show a profit. This being the case it is imperative to keep a close eye on the potential for a project to be profitable during the overall design process. Obviously the complexity and depth of the economic review will increase as the project design progresses. Discuss the various steps that one would expect to be applied to the economic evaluation throughout the design process. You might comment on how the current economic turmoil might have a bearing on this process.**

**4) Optimum Designs (20 Marks)**

**There are very few breakthrough chemical and hydrocarbon processes where the potential return is sufficient that the corporation can ignore the need to optimize a design. Discuss the various methods that may be used in order to optimize a design.**

**5) Alternate Investment and Replacement Analysis (20 Marks)**

**There are several practical issues that often need to be taken into consideration in addition to a theoretical assessment. Some of these things are availability of capital and "hurdle rate".**

**Although all estimates may have been made with the best attention to detail, it is impossible to predict the future with any degree of certainty.**

**The anticipated state of the economy and its expected future performance must be taken into consideration.**

**Competitive factors may be important such as the need to maintain a market position.**

**Discuss briefly how these factors may impact a business decision as to whether or not to proceed with a new venture or not.**

**What is the role of management in this situation?**

**6) Software in Process Development and Design (20 Marks)**

**Software is an essential factor in Process Development and Process Design.**

**Discuss how software is used in property estimation and the importance of this use.**

**What is the purpose of flowsheet simulators, their advantages and potential disadvantages?**

**Thirdly what is the role of software in cost estimation and financial analysis?**

**7) Tradeoffs in Process Design (20 Marks)**

**Discuss briefly how tradeoffs often occur during the following steps.**

**Feedstock preparation**

**Reactor selection and design**

**Separation and purification processes**

**Utilities such as heating and cooling.**