



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED CHEMISTRY

CHEMICAL ENGINEERING PLANT DESIGN

SCH 4108

Supplementary Examination Paper

July 2016

This examination paper consists of 3 pages

Time Allowed: 3 hours
Total Marks: 100
Special Requirements: None
Examiner's Name: Mr. B. Nyoni

INSTRUCTIONS

1. Answer all questions in Section A and any other three questions from Section B.
2. Each question carries 20 marks.
3. Show steps clearly in any calculation.
4. Start the answers for each question on a fresh page.
5. Use of calculators is permissible.

MARK ALLOCATION

QUESTION	MARKS
1.	20
2.	20
3.	20
4.	20
5.	20
6.	20
TOTAL POSSIBLE MARKS	100

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SECTION A

1 (a) Explain the following terms in relation to Chemical Engineering Plant Design:

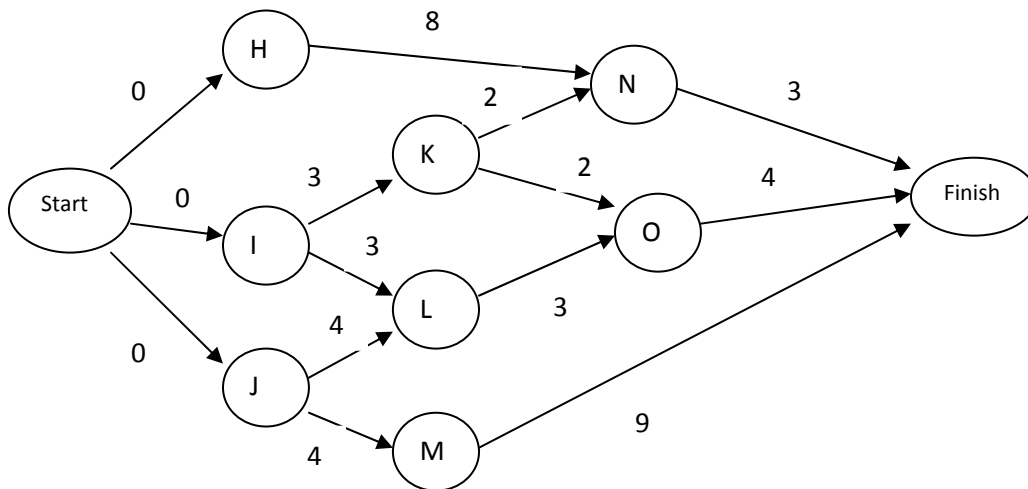
(i) Design objective.

(ii) Design constraint. [4]

(b) With the aid of a diagram, outline the anatomy of a chemical manufacturing process. [13]

(c) List any three ways of storing products. [3]

2 A project consists of the following activity network in which the vertices represent activities and the numbers next to the arcs represent time in days.



Assuming that an unlimited number of workers is available, write down:

(i) The minimum completion time.

(ii) The corresponding critical path. [18]

(iii) List any two projects where the critical path method can be applied. [2]

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SECTION B

3 (a) Define the following terms:

- (i) Computer simulation
- (ii) Flow-sheeting [8]

(b) List two advantages and disadvantages of computer aided design. [4]

(c) Giving an example of a simulation package you have used, list the general steps for creating a reactor design simulation. [8]

4 (a) List any four information facts that can be extracted from an MSDS about a material. [4]

(b) Discuss any two methods for analyzing hazards in industry. [8]

(c) Explain any three factors that affect the choice for plant location. [8]

5 (a) Explain the term degrees of freedom. [3]

(b) In a chemical reaction, substance A is converted into substance B at a rate that is proportional to the square of the amount of A. Initially ($t = 0$), 60 g of A are present and after 1 hour ($t = 1$), only 10 grams of A remain unconverted. How much of A is present after 2 hours? [17]

6 (a) Discuss any two factors that affect the investment and production costs. [6]

(b) Explain the difference between fixed and working capital. [6]

(c) The purchased cost of a heat exchanger for a 450 m² area in 1990 was \$25000.

(i) Estimate the cost of the same heat exchanger in 2001 using the two indices given below.

(ii) Comment on the results.

	1990	2001	
Marshall and Swift Index	915	1094	
Chemical Engineering Plant Cost Index	358	397	[8]

END OF PAPER!!!!

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