UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: BME 4033
COURSE	: MANUFACTURING SYSTEM DESIGN
SEMESTER/SESSION	: 2-2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 5 questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

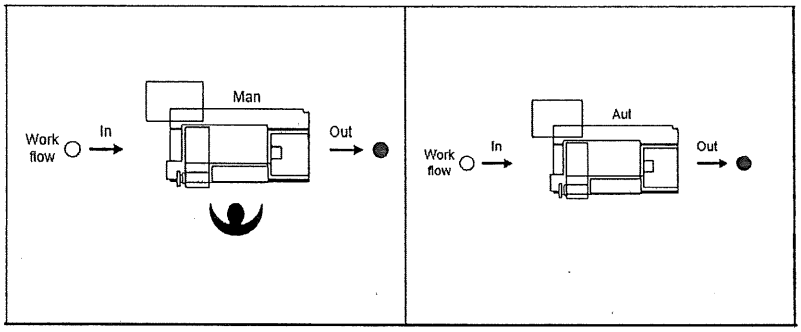
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 7 PRINTED PAGES INCLUDING COVER PAGE

Answer ALL questions.

QUESTION 1

Figure 1 shows single-station manufacturing cells. It can be used to perform either processing or assembly operations.



(a) (b)

Figure 1: Single-Station Manufacturing Cells

a) Predict the name of the single-station manufacturing cell in (a) and (b) accordingly. (2 marks)

b) Discover the reasons why single-station automated cell is important. (4 Marks)

c) Classify three (3) machine operations for single-station manned cell. (6 Marks)

d) Differentiate between single-station manned cells and single-station automated cells in terms of worker's attendance, production rate and operation. (6 Marks)

QUESTION 2

Production line can be divided into two basic types: manual assembly lines and automated production lines. However, hybrid lines consisting of both manual and automated operations are not uncommon.

a) Illustrate how the schematic diagram for:
   i. Manual assembly line (4 marks)
   ii. Automated production line (4 Marks)

b) Identify reasons why storage buffer is required in automated production line. (5 Marks)

c) Classify three (3) types of mechanized work transport system used in manual assembly line. (6 Marks)

d) Designate three (3) possible line pacing options implemented by production line. (9 Marks)

QUESTION 3

Parts classification and coding are used to identify part families, while the Hollier method is used to arrange machines in a Group Technology (GT) cell.

a) Given the rotational part design in Figure 2. By referring to Appendix 1, determine the form code in the Opitz classification and coding system.

(5 Marks)

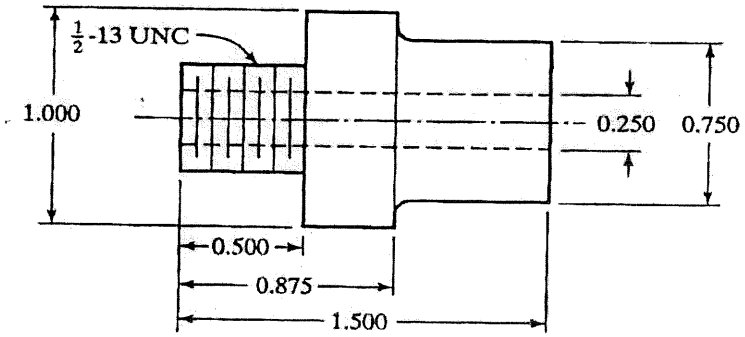


Figure 2: Part Design

b) Five machines will constitute a GT cell, as per Figure 3. By using Hollier Method, calculate percentage of in-sequence moves, bypassing moves and backtracking moves. (13 Marks)

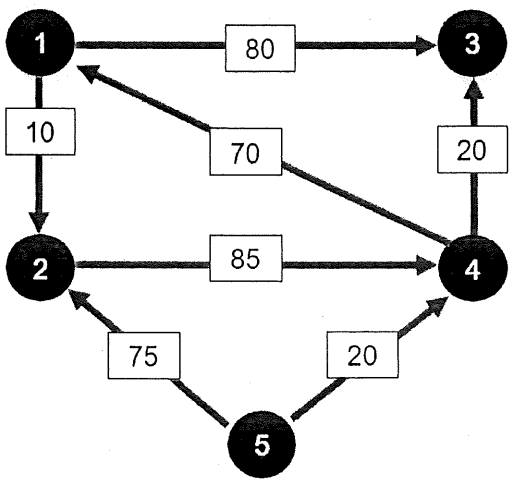


Figure 3: GT Cell for Five (5) Machines

QUESTION 4

Flexible manufacturing system (FMS) is a highly automated GT machine cell with one or more processing stations (typically CNC machine tools), interconnected by an automated material handling and storage system, and controlled by a distributed computer network.

a) Classify four (4) types of flexibility in FMS. (8 Marks)

b) Figure 4 depicts a manufacturing cell with automation, but is it a flexible manufacturing cell? Evaluate this circumstance by providing a thorough explanation. (10 marks)

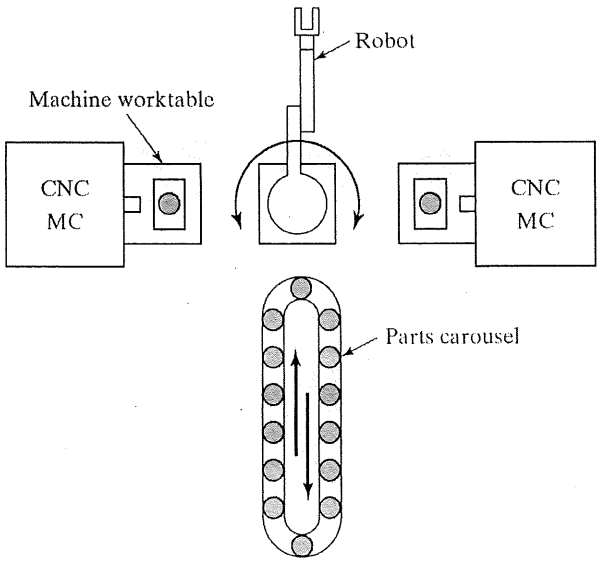


Figure 4: Robot-Centered Manufacturing Cell

QUESTION 5

Figure 5 present process of bread making by Gardenia.

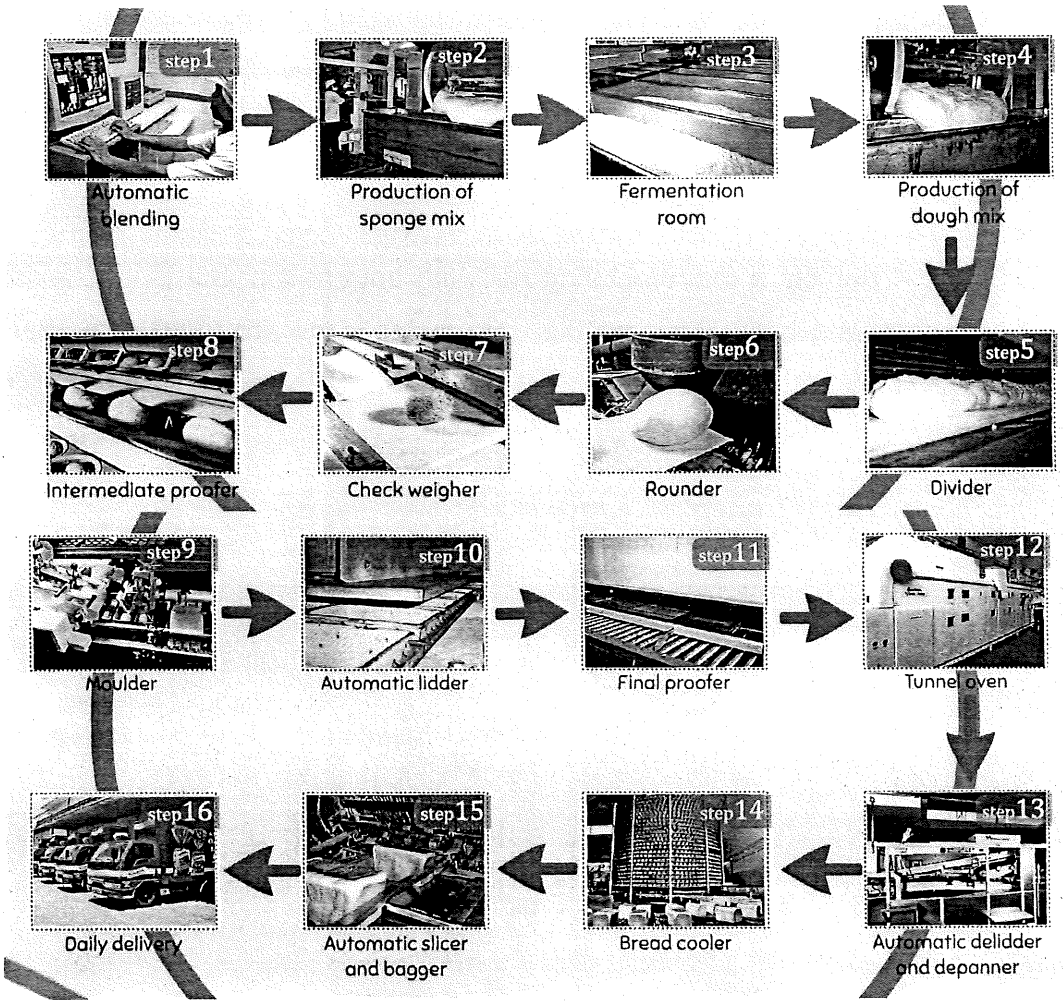


Figure 5: Process of Gardenia Bread

a) Identify what kind of material handling equipment and storage system might be used for pre-process, in-process, and post-process of bread making. (9 marks)

b) Recommend necessary improvements for current material handling and storage system in Gardenia. (9 marks)

APPENDIX 1

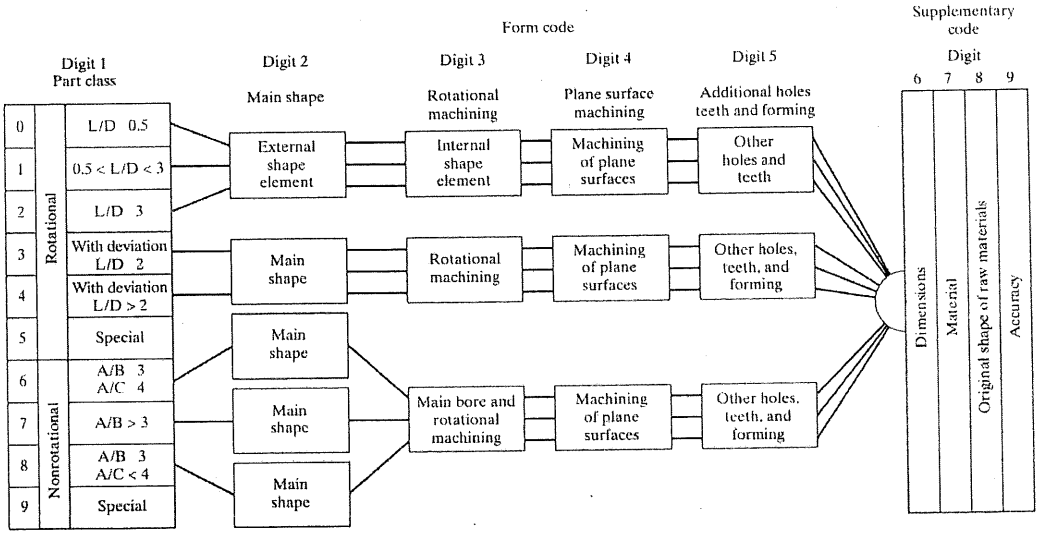


Figure 1: Basic Structure of the Opitz System of Parts Classification and Coding

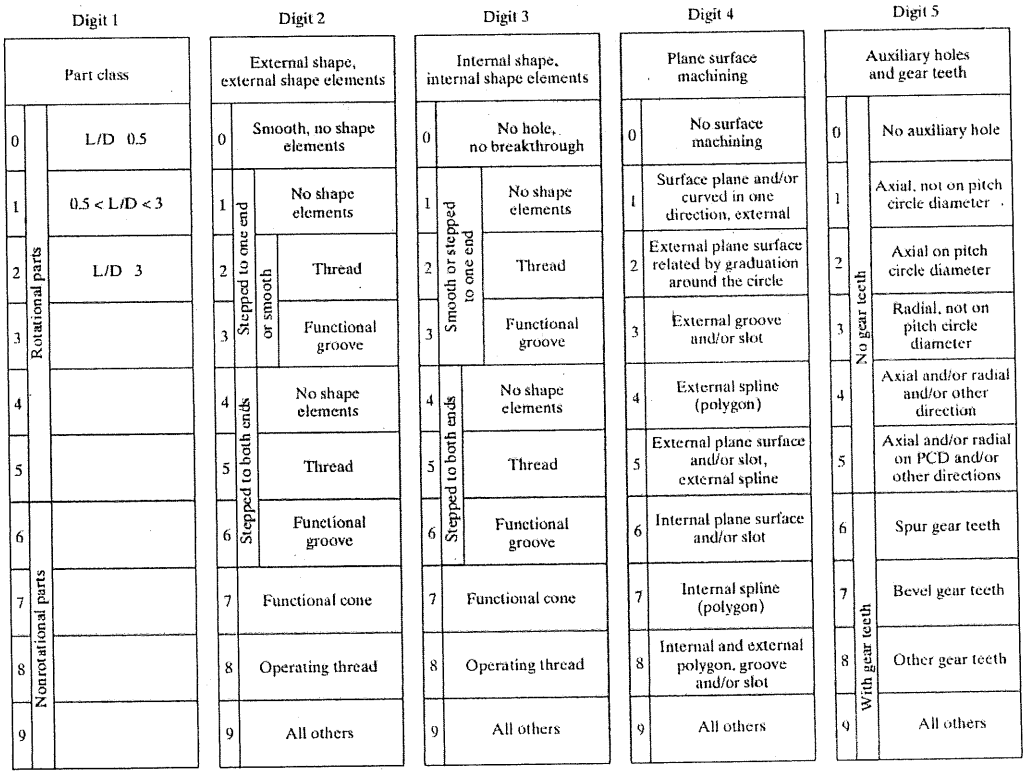


Figure 2: Form Code (Digits 1 through 5) for Rotational Parts in the Opitz Coding System. The First Digit of the Code is Limited to Values 0,1, or 2.

----------End of Questions ----------