UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BME 4033
COURSE	: MANUFACTURING SYSTEM DESIGN
SEMESTER/SESSION	: 1-2022/2023
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

A manufacturing system is defined as a collection of integrated equipment and human resources, whose function is to perform one or more processing and/or assembly operations on a starting raw material, part or set of parts. The manufacturing system is where the value-added work is accomplished on the parts and products.

a) **Predict** three (3) components in manufacturing system. (3 Marks)

b) **Sketch** classification of manufacturing system. (5 Marks)

c) **Discover** five (5) reasons of single-station widespread adoption. (5 Marks)

d) **Categorise** three (3) operations of machine for single-station manned cells. (6 Marks)

e) **Differentiate** between single-station manned cells and single-station automated cells in term of worker's attending, operation and production rate. (6 Marks)

QUESTION 2

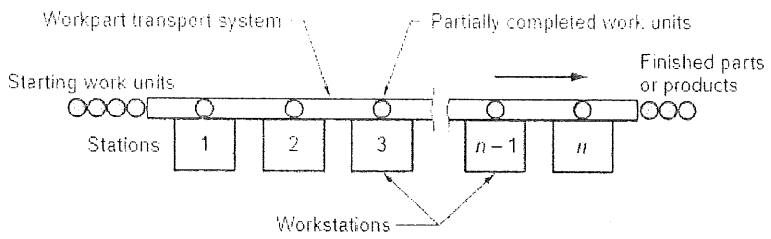


Figure 1: General Configuration of A Production Line

Production line consist of a series of workstations out laid so that the work unit moves from one station to next, and a portion of the total work content is performed at each station. Transfer of work units from one station to the next is usually accomplished by conveyor or other mechanical transport system.

a) **Illustrate how** configurations of manual assembly line and automated production line. (4 Marks)

b) **Identify** reasons why storage buffer is required in automated production line. (4 Marks)

c) **Determine** typical operations performed on manual assembly line workers. (5 Marks)

d) **Evaluate** three (3) major categories of mechanized work transport system used in manual assembly line. (6 Marks)

e) **Illustrate** three (3) possible layouts of segmented in-line configurations of automated production line. (6 Marks)

QUESTION 3

Parts classification and coding is the most time-consuming method of part family identification. Hollier use data contained from-to charts and is intended to place the machines in order to maximizes the proportion of in-sequences within the cell.

a) Given the rotational part design in Figure 2. By referring to Appendix 1, **determine** the suitable form code in the Opitz classification and coding system. (5 Marks)

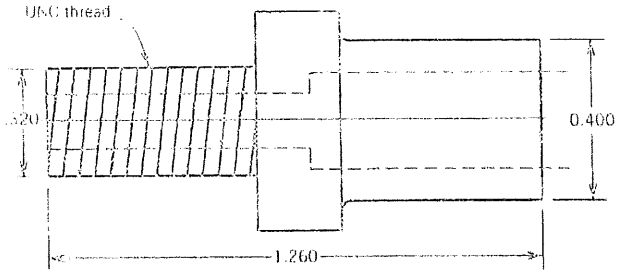


Figure 2: Part Design

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. (12 Marks)

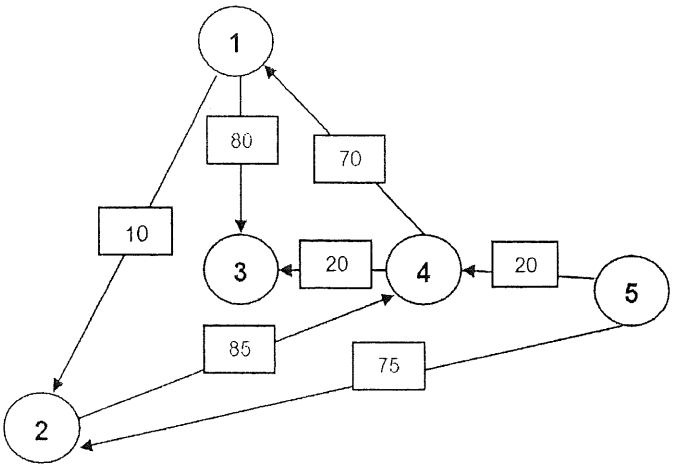
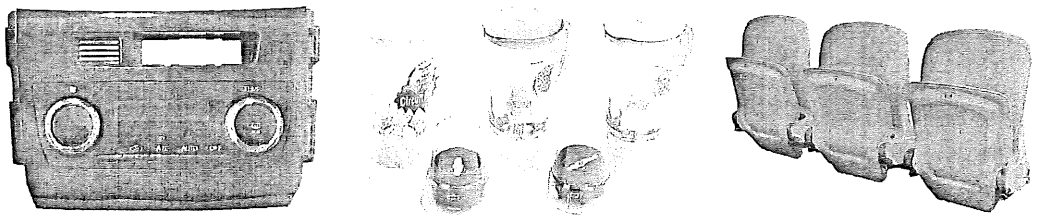


Figure 3: GT Cell for Five (5) Machine

QUESTION 4

Sipro Plastic Sdn. Bhd (Sipro) is a leading manufacturer and assembler of plastic parts and components for automotive, electrical, electronics, medical, packaging and other industries in Malaysia. Their products as per Figure 4. Sipro established in 1992, beginning with only 2 machines and now owning more than 60 machines of various tonnages. Among Sipro's trusted business partners are Perodua, Proton, Toyota, Panasonic etc. They strive to enhance customer satisfaction through continual improvement in product quality, delivery, services and committed to quality management system.



a) IP Center Floor Console b) Blender c) Stadium seat

Figure 4: Products of Sipro Plastic Sdn Bhd

In your opinion, did Sipro's production apply material handling and storage system? If yes, **identify** what kind of material handling equipment and storage system might be used for pre-process, in-process and post-process. Then **determine** at least four (4) necessary improvement for that current situation. If no, **illustrate how** material handling and storage system of Sipro's production should be? **Evaluate** your answer by giving details explanation. Any sketches can be added whenever required. (17 Marks)

QUESTION 5

Agile manufacturing is an alternative approach to flexible manufacturing. A flexible manufacturing system (FMS) is a highly automated GT machine cell, consisting one or more processing stations (usually CNC machine tools), interconnected by an automated material handling and storage system and controlled by a distributed computer system.

a) **Interpret** agile manufacturing principles in your own words. (6 Marks)

b) By any definition, Figure 5 shows an automated manufacturing cell but is it flexible manufacturing cell? **Evaluate** this situation by giving details explanation. (10 Marks)

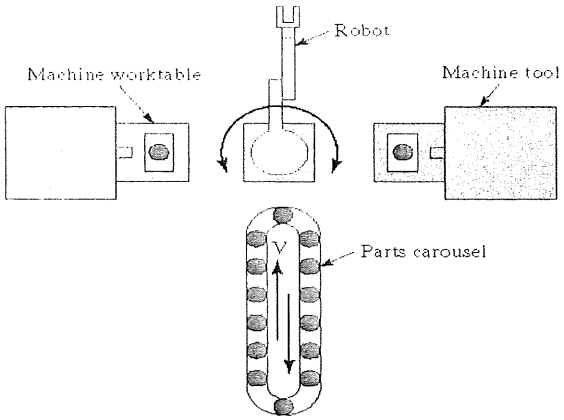


Figure 5: Automated Manufacturing Cell

APPENDIX 1

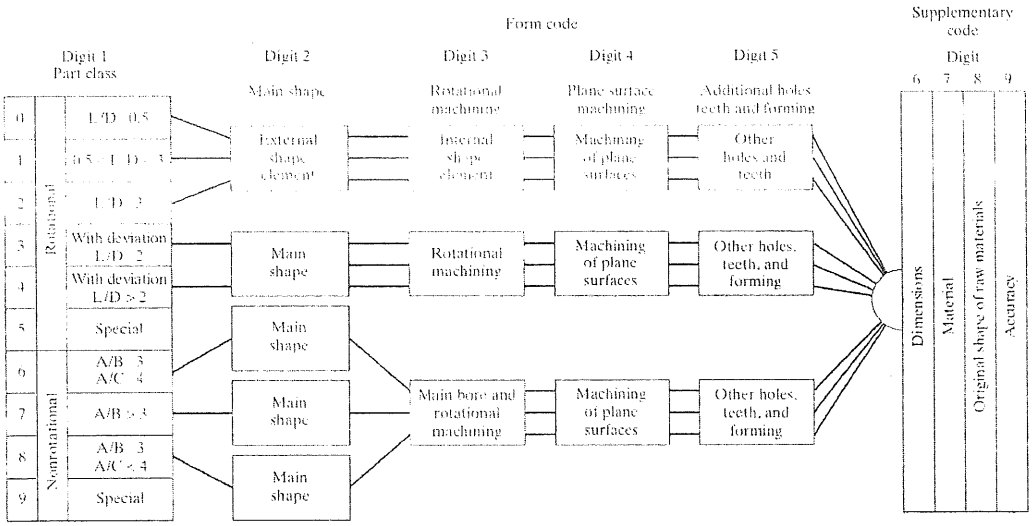


Figure 1: Basic Structure of the Opitz System of Parts Classification and Coding

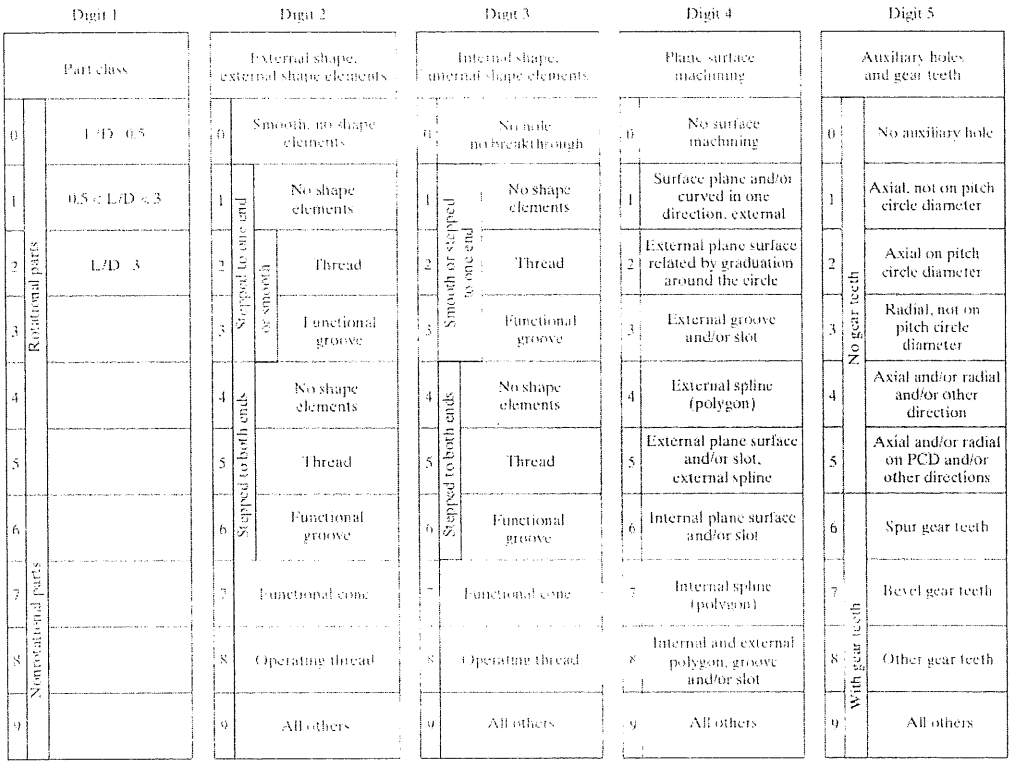


Figure 2: Form Code (Digits 1 through 5) for Rotational Parts in the Opitz Coding System. The First Digit of the Code is Limited to Values 0,1, or 2.

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