UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIO-ENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE	:	CRB40003
COURSE TITLE	:	MOLD AND DIE DESIGN
PROGRAMME NAME	:	BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (POLYMER) WITH HONOURS
DATE	:	29 JANUARY 2026
TIME	:	9:00AM - 12:00PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 6 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

QUESTION 1

Describe these terms. Support your answers with either relevant examples or illustrations.

(a) Sprue (5 marks)

(b) Cavity (5 marks)

(c) Runner (5 marks)

(d) Gate (5 marks)

QUESTION 2

Injection molding is a manufacturing process that involves injecting molten plastic material into a mold cavity under high pressure, where it cools and solidifies to form the desired shape. Figure 1 depicts the generic components of an injection mold.

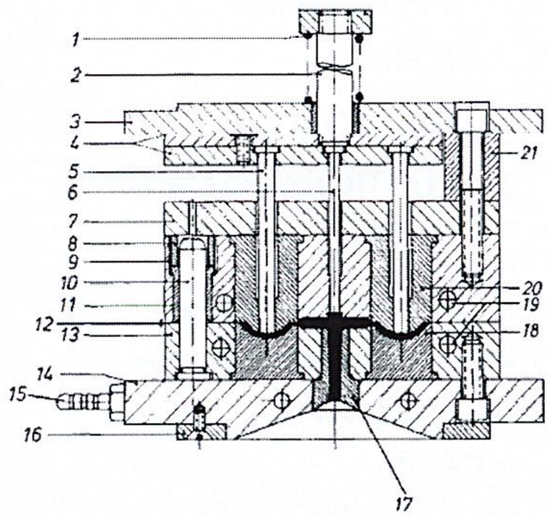

Figure 1: Designation of components of an injection mold.

(a) Name component 4 (labeled 4 in Figure 1). Explain the functions of component 4 in the injection molding process. (10 marks)

(b) Name component 10 (labeled 4 in Figure 1). Explain the functions of component 4 in the injection molding process. (10 marks)

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Riva Aquarama is experiencing sink marks and short shots in injection molding their boat instrument holders. These intricate parts have complex geometries, varying wall thicknesses, and numerous features. The current single, central gate on the backside may be inadequate, causing uneven filling. Adjusting processing parameters has yielded limited improvement, prompting a focus on gating system redesign for a more fundamental solution.

(a) Propose **TWO (2)** alternative gating strategies for the boat instrument holders to address sink marks and short shots.

(10 marks)

(b) Choose one strategy and construct **FIVE (5)** convincing arguments for how that strategy would improve the filling of thin sections, reduce shear stress on the molten plastic, and enhance cooling within the mold.

(10 marks)

Question 2

Foxconn, a leading global electronics manufacturer, is developing high-precision plastic wafer carriers for semiconductor fabrication. These carriers require intricate, thin-walled components with exceptionally precise dimensional tolerances and demanding performance characteristics. They must protect delicate silicon wafers, maintaining alignment during manufacturing, and feature complex geometries with precisely located wafer slots, internal airflow channels, and secure locking mechanisms. The thin walls, crucial for minimizing weight, present challenges in achieving dimensional accuracy and structural integrity.

(a) Appraise how runner diameter/shape, length, and layout/branching influence melt flow, pressure drop, and shear degradation during injection molding of high-precision, thin-walled plastic wafer carriers.

(10 marks)

(b) Recommend **FIVE (5)** specific runner system dimensions and layout features, justifying your choices based on minimizing pressure drop, maintaining melt temperature uniformity, and preventing excessive shear heating for high-precision, thin-walled plastic wafer carriers.

(10 marks)

Question 3

B. Braun, a leading global medical device manufacturer, is embarking on the development of a new line of minimally invasive surgical instruments. These instruments require intricate, thin-walled components with exceptionally precise dimensional tolerances and demanding performance characteristics.

(a) Appraise **FIVE (5)** influences of runner diameter/shape, length, and layout/branching on melt flow, pressure drop, and shear degradation during injection molding of surgical instruments with intricate, thin-walled components requiring precise tolerances.

(10 marks)

(b) Recommend **FIVE (5)** specific runner system dimensions and layout, justifying your choices based on minimizing pressure drop, maintaining melt temperature uniformity, and preventing excessive shear heating for minimally invasive surgical instruments with intricate, thin-walled components.

(10 marks)

Question 4

A high-performance packaging manufacturer extrudes a thin-walled profile from a semi-crystalline polymer blend for food container seals. While the profile's cross-section appears simple, it requires precise dimensions and a smooth, defect-free surface for proper sealing. The manufacturer experiences significant issues with extrudate surface roughness and dimensional instability, despite processing parameter adjustments.

(a) Appraise **FIVE (5)** die design's influence on the observed surface roughness and dimensional instability in the extruded profile.

(10 marks)

(b) Recommend **FIVE(5)** suitable solutions to this issue, providing detailed justifications for each recommendation based on the specific requirements of extruding a thin-walled profile for food container seals.

(10 marks)

END OF EXAMINATION PAPER