

CONFIDENTIAL



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023**

COURSE NAME : MANUFACTURING PROCESS TECHNOLOGY

COURSE CODE : BNM 20104

PROGRAMME CODE : BNM

EXAMINATION DATE : FEBRUARY 2023

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA **CLOSED BOOK**

THIS QUESTION PAPER CONSISTS OF **FIVE (5) PAGES**

CONFIDENTIAL

TERBUKA

UNIVERSITI TUN HUSSEIN ONN MALAYSIA
JALAN TUN HUSSEIN ONN
80100 JOHORE BAHRU
JAWAHAR MURNI
80100 JOHORE BAHRU
JAWAHAR MURNI

Q1 (a) Milling machines are constructed of column and knee structure. They are classified into horizontal milling machine and vertical milling machine.

(i) **Figure Q1 (a) (i)** shows a typical example of a vertical milling machine. Based on **Figure Q1 (a) (i)**, explain the function of main components of vertical milling machine, namely spindle, table, saddle, knee, and column.

(5 marks)

(ii) A product will be produced using vertical milling machine based on the part drawing as shown in **Figure Q1 (a) (ii)**. Prepare a complete work process plan for milling operation as depicted in **Table Q1 (a) (ii)**.

(6 marks)

(b) A cylindrical workpiece of 90 mm long and 5 cm in diameter will be turned to a diameter of 3 cm using lathe machine. The cutting conditions are as follows: cutting speed is 1.5 m/s, and feed is 0.15 mm/rev. A list of common formulas for turning operation is given in **Table Q1 (b)**.

(i) Calculate machining time.

(5 marks)

(ii) Calculate material removal rate.

(9 marks)

Q2 (a) Metal casting process can be divided according to the type of mold used, namely expendable-mold casting and permanent-mold casting. Distinguish **THREE (3)** characteristics between expendable-molds and permanent-molds.

(6 marks)

(b) Bulk deformation process by means of forging is generally characterized as metal forming, which causes a significant shape change by deforming metal parts that was originally in bulk rather than in sheet metal form. Use sketches with proper labels to show the following deformation processes:

(i) Open-die forging

(3 marks)

(ii) Flashless forging

(3 marks)

(c) The most commercially important processes of plastic-shaping through extrusion and injection molding are those associated with thermoplastics. Identify **THREE (3)** advantages of shaping processes for plastics over other manufacturing processes.

(6 marks)

(d) Ceramic materials can be grouped into traditional ceramics, new ceramics (advanced ceramics), and glasses. Distinguish between traditional ceramics and new ceramics (advanced ceramics) in terms of raw material use and products application.

(7 marks)

- Q3** (a) There are various types of permanent joining processes and mechanical fastening methods available in engineering application such as brazing, soldering and rivet.
- (i) Differentiate **THREE (3)** main characteristics between brazing and soldering process. (6 marks)
 - (ii) Rivets are the primary mechanical fastening method in aircraft and aerospace industries. Identify **TWO (2)** advantages of rivets application. (4 marks)
- (b) Arc welding is commonly referred to as fusion-welding process in which coalescence of the metals is achieved by the heat of an electric arc between an electrode and the work.
- (i) Describe the following process of arc welding:
 - 1) SMAW
 - 2) GMAW
 - 3) GTAW
 - 4) FCAW(8 marks)
 - (ii) Interpret the arc welding electrode designation code of E7018 based on American Welding Society (AWS) standard as shown in **Figure Q3 (b) (ii)**. (7 marks)
- Q4** (a) One of the functions of green manufacturing is seen as being the need to move from a linear transformation of material into ones utilising cyclical transformations systems.
- (i) Identify **FOUR (4)** approaches of green manufacturing to support environmental sustainability. (8 marks)
 - (ii) Outline **FOUR (4)** relative merits of cyclical transformation of material over linear transformation within the context of resource conservation. (8 marks)
- (b) Manufacturing process whether through processing or assembly operations often tends to produce some unwanted waste, which bears a significant environmental impact.
- (i) List **TWO (2)** examples of gaseous waste generated from welding process, and **THREE (3)** examples of solid waste generated from milling process. (5 marks)
 - (ii) Explain **TWO (2)** methods to minimize liquid waste in the form of spent coolant generated from turning process by lathe machine. (4 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2022 / 2023

PROGRAM CODE : BNM

COURSE NAME : MANUFACTURING PROCESS TECHNOLOGY

COURSE CODE : BNM 20104

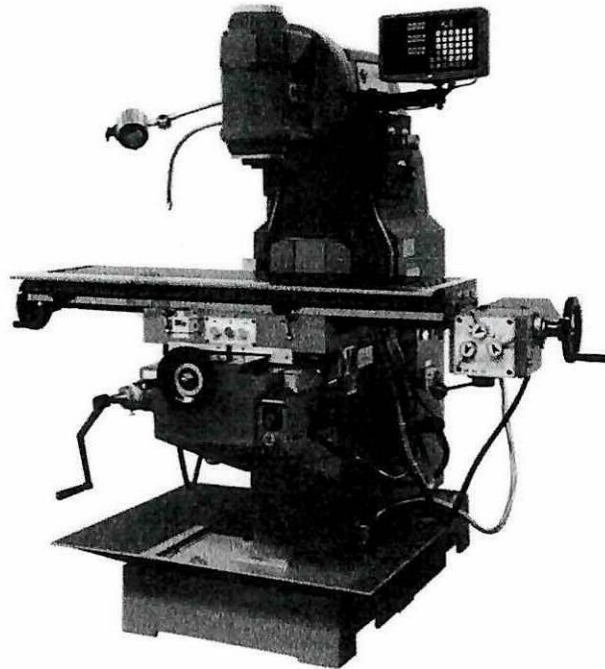


Figure Q1 (a) (i): Vertical Milling Machine

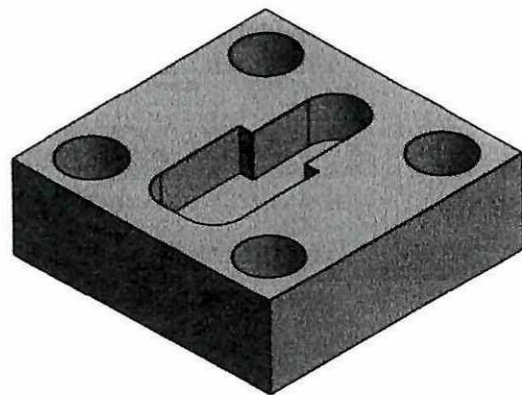
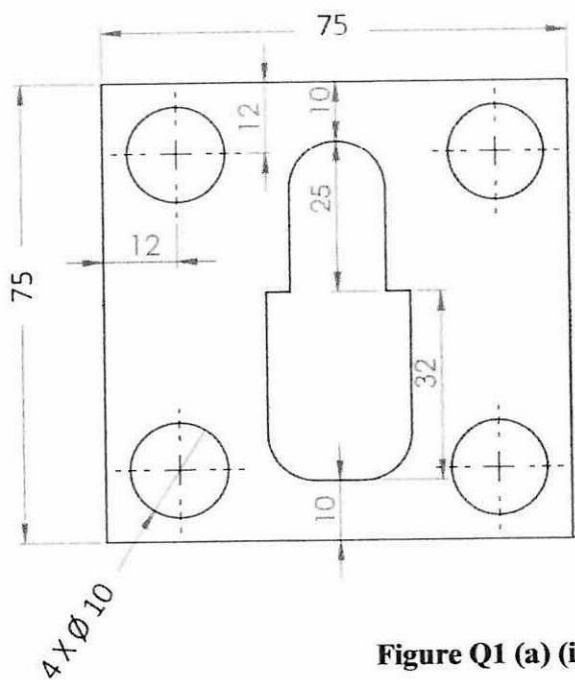


Figure Q1 (a) (ii): Part Drawing

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2022 / 2023

PROGRAM CODE : BNM

COURSE NAME : MANUFACTURING PROCESS TECHNOLOGY

COURSE CODE : BNM 20104

Table Q1 (a) (ii): Work Process Plan for Milling Operation

| Operation No | Features | Name of Process | Cutting Tool | |
|--------------|----------------|-----------------|--------------|-------------|
| | | | Tool's Name | Tool's Size |
| 1 | Flat Surface | | Face Mill | Ø 45 mm |
| 2 | Pocket | | | Ø 10 mm |
| 3 | Centre Marking | Punching | Centre Punch | Ø 8 mm |
| 4 | Through Holes | | | |

Table Q1 (b): Common Formulas for Turning Operation

| Equation No | Mathematical Formula |
|-------------|----------------------------------|
| 1 | $N = V / \pi D_o$ |
| 2 | $d = (D_o - D_f) / 2$ |
| 3 | $F_r = NF$ |
| 4 | $T_m = L / F_r = \pi D_o L / FV$ |
| 5 | $MRR = VFd$ |



Figure Q3 (b) (ii): Welding Electrode