Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	MANUFACTURING PROCESS TECHNOLOGY
COURSE CODE	:	BNM 20104
PROGRAMME CODE	:	BNG
EXAMINATION DATE	:	JULY / AUGUST 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 **FOUR (4)** PAGES

Q1 (a) 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) Flashless forging

(3 marks)

(ii) Open-die forging

(3 marks)

(b) 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)

(c) 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)

(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)

Q2 (a) 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)

(b) 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)

Q3 (a) The physical integrity of welding structure depends on weld quality with fewer defects.

(i) Illustrate **THREE (3)** common types of defects in Arc Welding (AW) process using a sketch.

(9 marks)

(ii) Identify **THREE (3)** reasons why Solid-state Welding (SW) processes are suitable for use in many automotive manufacturing companies.

(6 marks)

(b) Welding is a joining process in which parts are joined by heat or pressure.

(i) Outline welding processes into **TWO (2)** major types of joining process.

(6 marks)

(ii) Explain **TWO (2)** characteristics of Arc Welding (AW) process.

(4 marks)

Q4 (a) A cylindrical mild steel workpiece with a length of 20 cm and a diameter of 5 cm is being turned in diameter to 3 cm using a conventional lathe machine. The spindle rotates at 400 rpm, and the feed for turning operation is 0.50 mm/rev.

Formula:

1) Spindle Rotational Speed
   $N\ (rpm) = V / \pi D_o$
   Cutting Tool Speed, V (mm/min), Workpiece Original Diameter, D_o (mm)
2) Depth of Cut
   $d\ (mm) = (D_o - D_f) / 2$
   Workpiece Final Diameter, D_f (mm)
3) Feed Rate
   $F_r\ (mm/min) = NF$
   Feed, F (mm/rev)
4) Machining Time
   $T_m\ (min) = L / F_r = \pi D_o L / FV$
5) Material Removal Rate
   $MRR\ (mm^3/min) = VFd$

Given,
L = 200 mm, D_o = 50 mm, D_f = 30 mm, N = 400 rpm, F = 0.50 mm/rev.

(i) Calculate machining time

(5 marks)

(ii) Calculate material removal rate.

(6 marks)

(b) Machining operations by turning and milling are the most versatile of all manufacturing processes in their capability to produce a diversity of part geometries and geometric features.

(i) Differentiate **FOUR (4)** characteristics between turning and milling operations.

(8 marks)

(ii) Demonstrate the operations of up milling and down milling using a sketch.

(6 marks)

- END OF QUESTIONS -