



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015**

COURSE NAME : MANUFACTURING PROCESS TECHNOLOGY

COURSE CODE : BNM 20103

PROGRAMME : 2 BNM

EXAMINATION DATE : JUNE/JULY 2015

DURATION : 2 HOURS 30 MINUTES

INSTRUCTION : ANSWER FIVE (5) QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

- Q1** (a) Draw a neat figure of a force diagram showing the geometric relationship between all the forces acting on the chips in orthogonal cutting. (7 marks)
- (b) List down the **THREE (3)** types of conventional machining in material removal processes other than turning and milling operations. (3 marks)
- (c) In an orthogonal cutting operation, the cutting tool has a rake angle of 12° . The depth of cut is 1.25 mm and the chips produced have thickness of 1.75 mm. The diameter of the work material is 42 mm and rotates at 1200 revolutions per minute. The feed rate of the tool is 0.15 mm/rev.

Calculate the following:

- (i) Chip thickness ratio
(ii) Shear plane angle
(iii) Time taken to turn 125 mm length out of total length of 275 mm
(iv) Material Removal Rate (MRR) for 125 mm length of turning (5 marks)
- (d) A slab milling operation is performed to finish the top surface of a steel work piece rectangular in section. The size of the work material is 350 mm length and 76 mm wide. A helical milling cutter, which has a 75 mm diameter and ten teeth, is set up to machine. The cutting speed is 130 m/min, the chip load is 0.15 mm/tooth and depth of cut is 3 mm.

Calculate the following:

- (i) Time taken to make one pass across the surface
(ii) Material Removal Rate (MRR) (5 marks)
- Q2** (a) What is a casting process? State **THREE (3)** advantages of casting process. (4 marks)
- (b) Briefly explain the function of flask, riser, core and pattern in the sand casting molds. (4 marks)
- (c) Show the process flow of an investment casting process with the aid of diagram. (7 marks)

- (d) A mechanical part with the tolerance of ± 0.076 mm and thin thickness will be produced using a casting process. The product needs to be produced in a high quantity and good quality of surface finish and dimensional accuracy with less finishing process. In order to produce this part, select the best casting process and discuss why it is selected.

(5 marks)

- Q3** (a) List **FOUR (4)** different types of metal rolling processes.

(2 marks)

- (b) Briefly explain the operation of open die forging, impression die forging and flashless forging.

(6 marks)

- (c) Describe forward and backward extrusion assisted with diagram.

(4 marks)

- (d) Compare the process of blanking and punching with the aid of diagram.

(4 marks)

- (e) List the advantages and disadvantages of hot working and cold working processes.

(4 marks)

- Q4** (a) Illustrate the die swell in plastic processing and describe the process briefly.

(3 marks)

- (b) In injection-molding operations, it is common practice to remove the part from its runner, place the runner in a shredder and recycle the runner by producing pellets. List the concerns you may have in using such recycled pellets for products as against virgin pellets.

(3 marks)

- (c) Distinguish between thermoplastic and thermosetting polymers. Give example for each case.

(4 marks)

- (d) Compare the difference between injection moulding and plastic extrusion processes with the aid of diagram.

(4 marks)

- (e) Sketch and explain briefly the vacuum thermoforming process.

(6 marks)

- Q5**
- (a) In powder metallurgy process, packing factor is a very important characteristic to be known. Classify the relationship between packing factor and porosity of compacted parts.
(3 marks)
 - (b) Give **TWO (2)** factors to determine the value of packing factor for powder material.
(2 marks)
 - (c) Describe the method of how does the packing factor of powder material can be increased and strengthen the produced parts.
(3 marks)
 - (d) Classify the **THREE (3)** basic steps in the conventional powder metallurgy shaping process with the aid of diagram.
(12 marks)
- Q6**
- (a) List the important of joining process in manufacturing and assembly operations. Give examples that fit to each category.
(3 marks)
 - (b) Thermite welding is commonly used for welding rail-road rails. List the reasons that make thermite welding attractive for this application.
(4 marks)
 - (c) Welding operator found out that the joint result of metal inert gas (MIG) welded products are not constant. Some of the parts were seriously burnt and full of porosity. There were welded with inconsistent penetration depth. List out **THREE (3)** possible reasons and explain the countermeasures that can be taken.
(6 marks)
 - (d) Draw and list **FOUR (4)** types of basic rivets.
(4 marks)
 - (e) Show the snap fit process before and after assembly.
(3 marks)

- END OF QUESTION -