



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

Bachelor of Engineering (Hons) Degree Industrial and Manufacturing Engineering

MANUFACTURING PROCESS III

TIE 5103

FIRST SEMESTER MAIN EXAMINATION

DECEMBER 2014

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Nil

Examiner's Name: Eng. M. Makhurane

INSTRUCTIONS AND INFORMATION TO CANDIDATES

1. Answer any five (5) questions
2. Each question carries 20 marks

MARK ALLOCATION

| QUESTION | MARKS |
|-----------------|--------------|
| 1. | 20 |
| 2. | 20 |
| 3. | 20 |
| 4. | 20 |
| 5. | 20 |
| 6 | 20 |
| 7 | 20 |
| TOTAL | 100 |

QUESTION 1

- a) What are the three steps in the sintering cycle in Powder Metallurgy [8]
- b) Describe using clearly labeled diagrams what cold isostatic pressing (CIP) is, stating the advantages of using the process. [12]

QUESTION 2

A face milling operation is performed on the top surface of a steel rectangular workpiece 24cm long by 5cm wide. The milling cutter follows a path that is centered over the workpiece. It has five teeth and a 6cm diameter. Cutting speed is 7500 cm/min, feed is 0.012 cm/tooth, and depth of cut is 0.3cm. Determine

- a) the actual cutting time to make one pass across the surface [4]
- b) the maximum metal removal rate during the cut. [4]
- c) If an additional approach distance of 1cm is provided at the beginning of the pass (before cutting begins), and an over travel distance is provided at the end of the pass equal to the cutter radius plus 1cm, what is the duration of the feed motion. [12]

QUESTION 3

- a) Use illustrative sketches to show your understating of extrusion blow molding [12]
- b) A drilling operation is to be performed with a 12.7 mm diameter twist drill in a steel work part. The hole is a blind hole at a depth of 60mm and the point angle is 118° . The cutting speed is 25 m/min and the feed is 0.30 mm/rev. Determine
 - i) the cutting time to complete the drilling operation, [4]
 - ii) metal removal rate during the operation, after the drill bit reaches full diameter. [4]

QUESTION 4

- a) Define the following terms as used in turning
 - i. Dog plate, [1]
 - ii. Face plate, [1]
 - iii. Collet. [1]
- b) Discuss 5 considerations that make powder metallurgy an important commercial technology [5]

- c) The peripheral milling process in Fig Q4 illustrates two approaches. Name the approaches and outline the advantages that one has over the other. [12]

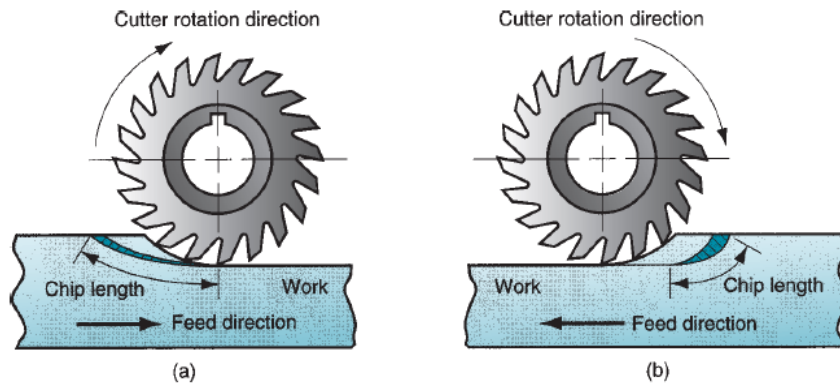


Fig Q4: Peripheral Milling

QUESTION 5

- a) Explain the following terms as used in manufacturing processes [8]
- i. Circular sawing,
 - ii. Abrasive cut-off,
 - iii. Hack sawing,
 - iv. Band sawing.
- b) Show by illustrative sketches peripheral milling and face milling [12]

QUESTION 6

The Procurement Manager at Museyamwe Aluminium Engineering was offered discounts on grinding wheels. The Engineering Manager was not pleased with the coding on the grinding wheels. All of them had the following

Code - 30 A 46 H 6 V CH

What did the code mean and how was it going to influence the quality of Aluminium products processes using the grinding discs. [20]

QUESTION 7

Use clearly labeled sketches to show how you would achieve the part show in Figure Q7



(a)

Figure Q7: Part features

[20]