

THE UNIVERSITY OF ZAMBIA SCHOOL OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

MEC 3102 PRODUCTION TECHNOLOGY AND ELECTRICITY & ELECTRONICS II

TUTORIAL/ASSIGNMENT NO 2.

(MACHINING OPERATIONS AND MACHINE TOOLS & CUTTING TOOL TECHNOLOGY)

Submit Q1, Q2, Q3, Q4, and Q5 as Assignment 2

DUE DATE: 4th NOVEMEBER 2022

(NB: Marks will be deducted for not showing your work)

Q1. It is required to assess the cutting qualities of a certain batch of HSS tools by means of a 'short life' practical test. The following values of spindle speed (rev/min) and length of travel (L) of the lathe carriage up to the failure of each tool are applicable to such a test:

Spindle speed(rev/min)	395	343	256
Length L(mm)	26.5	64.8	398

Workpiece diameter 90 mm, feed 0.5 mm/rev, depth of cut 1.4 mm.

From this data calculate the constants of the tool life equation $VT^n = C$. Determine the tool life to be expected when cutting at 45 m/min.

Q2. (a) What is the difference between peripheral milling and face milling?

(b) A face milling operation removes 6.0 mm from the top surface of a rectangular piece of aluminium that is 300 mm long by 90 mm wide by 75 mm thick. The cutter follows a path that is

centred over the workpiece. It has four teeth and is 100 mm in diameter. Cutting speed = 2.0 m/s, and chip load = 0.27 mm/ tooth.

Determine:

(a) Machining time,

- (b) Maximum metal removal rate during cutting.
- Q3. A peripheral milling operation is performed on the top surface of a rectangular workpart, which is 300 mm long by 100 mm wide. The milling cutter, which is 75 mm in diameter and has four teeth, overhangs the width of the part on both sides. Cutting conditions are v = 80 m/min, f = 0.2 mm/tooth and d = 7.0 mm.

Determine:

- (a) The time to make one pass across the surface,
- (b) The material removal rate during the cut.
- Q4. A drilling operation is to be performed with a 25.4 mm diameter twist drill in a steel work part. The hole is a blind-hole at a depth = 50 mm, and the point angle = 118°. Cutting conditions are: speed = 25 m/min, feed = 0.25 mm/rev.

Determine:

- (a) The cutting time to complete the drilling operation,
- (b) Metal removal rate during the operation, after the drill bit reaches full diameter.
- Q5. Tool life tests in turning yield the following data: (1) v = 100 m/min, T = 10 min; (2) v = 75 m/min, T = 30 min.
 - (a) Determine the n and C values in the Taylor tool life equation. Based on your equation, compute
 - (b) the tool life for a speed of 90 m/min, and
 - (c) The speed corresponding to a tool life of 20 min.

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