



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

EMM 212: WORKSHOP PROCESSES AND PRACTICE II

DATE: 16/12/2021

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

- 1) The paper consists of Five questions**
- 2) Question ONE is Compulsory and carries Thirty Marks**
- 3) Choose any TWO other questions from the paper**

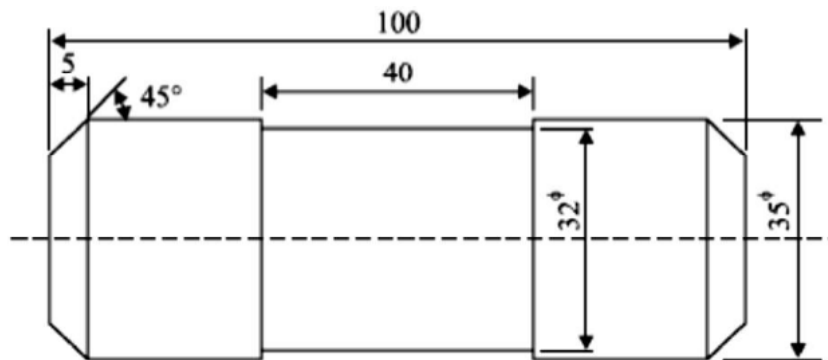
QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Define cutting speed. List various factors affecting cutting speed. (4 marks)
- b) Define tool approach and tool travel (3 marks)
- c) Name the various ways in which a workpart can be held in a lathe. (2 marks)
- d) Name the seven elements of tool geometry for a single point cutting tool. (5 marks)
- e) With aid of sketches, explain any six machining operations performed on a lathe machine. (6 marks)
- f) A cylindrical workpart 125 mm in diameter and 900 mm long is to be turned in an engine lathe. Cutting conditions are: $v = 2.5$ m/s, $f = 0.3$ mm/rev, and $d = 2.0$ mm. Determine: (a) cutting time, and (b) metal removal rate. (5 marks)

- g) A drilling operation is to be performed with a 25.4 mm diameter twist drill in a steel workpart. 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, and (b) metal removal rate during the operation, after the drill bit reaches full diameter. (5 marks)

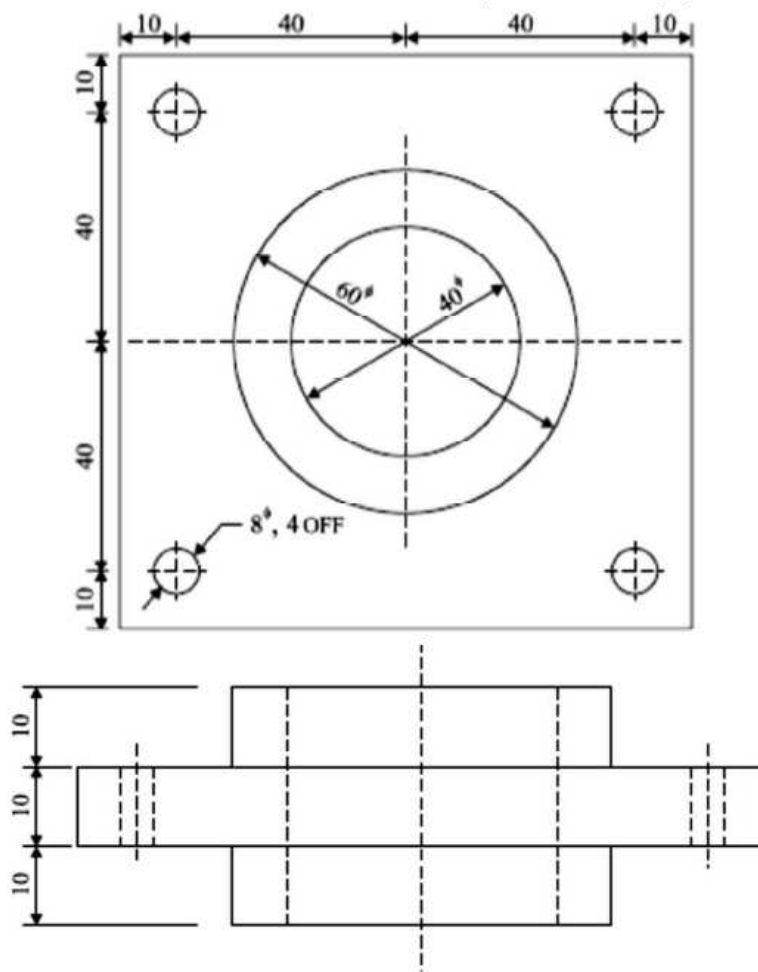
QUESTION TWO (20 MARKS)

- a) What is machining time? (2 marks)
- b) Write steps involved in cutting time calculation (3 marks)
- c) What is meant by the designation 12 x 36 inch lathe? (2 marks)
- d) Explain any three main elements of jigs and fixtures. (5 marks)
- e) A mild steel bar 100 mm long and 38 mm in diameter is turned to 35 mm dia. And was again turned to a diameter of 32 mm over a length of 40 mm as shown in the Fig. 5.23. The bar was machined at both the ends to give a chamfer of $45^\circ \times 5$ mm after facing. Calculate the machining time. Assume cutting speed of 60 m/min and feed 0.4 mm/rev. The depth of cut is not to exceed 3 mm in any operation. (8 marks)



QUESTION THREE (20 MARKS)

- a) What is a blind hole? (2 marks)
- b) Identify the alternative ways by which a cutting tool is held in place during machining. (3 marks)
- c) Identify the mechanisms by which cutting tools wear during machining. (3 marks)
- d) What are the differences between jigs and fixtures? (5 marks)
- e) Calculate the machining time to drill four 8 mm dia holes and one 40 mm dia central hole in the flange shown in Fig. below. 20 mm dia hole is drilled first and then enlarged to 40 mm dia hole. Take cutting speed 10 m/min, feed for 8 mm drill 0.1 mm/rev, for 20 mm drill feed is 0.2 mm/rev. and for 40 mm drill feed is 0.4 mm/rev. Neglect the approach distance. (7 marks)



QUESTION FOUR (20 MARKS)

- Describe the turning process. (2 marks)
- Name the three modes of tool failure in machining. (2 marks)
- Explain the main parts of shaper machine. (5 marks)
- Explain how the size of a shaper is specified (4 marks)
- Find the time required on a shaper to machine a plate 600 mm × 1,200 mm, if the cutting speed is 15 meters/min. The ratio of return stroke time to cutting time is 2:3. The clearance at each end is 25 mm along the length and 15 mm on width. Two cuts are required, one roughing cut with cross feed of 2 mm per stroke and one finishing cut with feed of 1 mm per stroke. (7 marks)

QUESTION FIVE (20 MARKS)

- a) What are some of the tool life criteria used in production machining operations? (5 marks)
- b) What is meant by the parameter C in the Taylor tool life equation? (2 marks)
- c) Name and briefly describe the three types of chips that occur in metal cutting. (5 marks)
- d) 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. (8 marks)