



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

EMM 211: WORKSHOP PROCESSES & PRACTICE II

DATE: 25/3/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

- i) This examination contains **FIVE** questions.
- ii) You are required to answer **THREE** questions only
- iii) **Section A** (Question **ONE**) is compulsory
- iv) Attempt **ONE** question from **Section B** and **ONE** question from **Section C**
- v) Questions **ONE** carries **30 marks** and the **others** carry **20 marks** each.

QUESTION ONE (30 MARKS)

- a) Using neat sketches, differentiate between Internal Threading and Boring tools (2 marks)
- b) List **SIX** major factors that influence the selection of a suitable machining process (3 marks)
- c) Use neat sketches to describe the following lathe operations. (4 marks)
 - i. Facing
 - ii. Plain turning.
- d) A taper pin of length 90 mm has a taper length of 50 mm. Determine (4 marks)
 - i. Taper in mm/metre
 - ii. The angle to which the compound rest should be set up
 - iii. The tailstock setting over.

- e) Enumerate **SIX** ways in which the turret and capstan lathes differ from general purpose lathe. (3 marks)
- f) A Cast Iron plate measuring 450 mm X 150 mm X 60 mm is to be rough shaped along its wider face. Calculate the machining time taking cutting speed = 10 m/min, return speed = 15 m/min, approach = 30 mm, over travel = 30 mm, allowance on either side of the plate width = 6 mm and feed per cycle = 1.5mm. (4 marks)
- g) List any **EIGHT** drilling machine tools. (4 marks)
- h) A hole of 30 mm diameter and 75 mm depth is to be drilled. The suggested feed is 1.3 mm per rev. and the cutting speed is 62 m/min. Assuming tool approach and tool over travel as 6 mm, calculate; (6 marks)
 - i. Spindle r.p.m
 - ii. Feed speed.
 - iii. Cutting time.
 - iv. Material removal rate.

SECTION B

QUESTION TWO (20 MARKS)

- a) Using a neat sketch illustrate the working principle of a centre lathe. (6 marks)
- b) A work piece of 300 mm diameter and 600 mm length is to be turned down to 282 mm for the entire length. The suggested feed is 1.2 mm/revolution and the cutting speed is 162 m/min. The maximum allowable depth of cut is 4.5 mm. (6 marks)
 - i. Spindle r.p.m
 - ii. Feed speed.
 - iii. Material removal rate.
 - iv. Cutting time.
- c) A two-start external square thread of 10 mm pitch and outside diameter of 62 mm is to be cut on a centre lathe which has a 6 mm pitch lead screw. (8 marks)
 - i. Depth of thread to give 0.12 mm clearance.
 - ii. Lead of thread.
 - iii. Core diameter.
 - iv. Helix angle of thread.
 - v. Gear ratio between the headstock spindle and lathe lead screw.

QUESTION THREE (20 MARKS)

- a) Explain **FOUR** ways in which shapers are classified. (8 marks)
- b) Using a neat sketch identify the principal parts of a shaper. (6 marks)
- c) Calculate the time required to machine the top surface of slab 450 mm (wide) by 3500 mm (long) on a planer, using the following data.
Cutting speed = 19.2 m/min; Return speed = 76.5 m/min; Machining allowance = 10 mm;
Tool approach angle = 45°; Cross feed of tool = 3 mm/full stroke; Side over travel of tool = 3 mm; Table over travel on both side = 300 mm. (6 marks)

SECTION C

QUESTION FOUR (20 MARKS)

- a) List **FIVE** ways in which machining drills may be classified giving an example in each case. (5 marks)
- b) Using neat sketches differentiate between counterboring and countersinking. (5 marks)
- c) Define the following terms as applied in drilling operations. (3 marks)
- i) Reaming
 - ii) Tapping
 - iii) Trepanning
- d) Highlight **FOUR** advantages of twist drills. (4 marks)
- e) Enumerate **THREE** factors upon which the selection of drills depends on. (3 marks)

QUESTION FIVE (20 MARKS)

- a) Describe **SIX** ways in which the size of a lathe is specified. (6 marks)
- b) Calculate the time taken to face a workpiece of 80 mm diameter. The spindle speed is 90 r.p.m and cross feed is 0.3 mm/revolution. (2 marks)
- c) Highlight **FIVE** advantages of hydraulic drive shaper. (5 marks)
- d) Illustrate the elements of a twist drill using a neat sketch. (4 marks)
- e) List **SIX** types of reamers as applied in drilling operations. (3 marks)