



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 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 & PRACTICE II

DATE: 9/8/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer question ONE and any other two questions

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- a) Match parts A and B in connection with parts of a shaper. (2 marks)

S. No	A	B
1.	Main support for the operating mechanism. The top is machined and scraped to form a flat bearing for the ram	a) Cross rail
2.	Used to carry the worktable and saddle, also part of the table feeding mechanism	b) Cross feed screw.
3.	Moves the apron right and left on the rail	c) Tool slide clamp screw.
4.	Used to clamp the head to the head to the head swivel when shaping with the horizontal feed.	d) Column

- b) List any other **SIX** operations that can be performed on a drilling press apart from the main drilling operation. (3 marks)
- c) Use neat sketches to describe the following lathe operations.
- i. Facing (2 marks)
 - ii. Plain turning. (2 marks)
- d) Find the time required for drilling an 18 mm hole in a workpiece having thickness 50 mm. Assume cutting speed of 12 metres/minute and feed of 0.2 mm/revolution. Neglect the length of approach. (4 marks)
- 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;
- i. Spindle r.p.m (2 marks)
 - ii. Feed speed. (1 mark)
 - iii. Cutting time. (1 mark)
 - iv. Material removal rate. (2 marks)

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.
- i. Spindle r.p.m (2 marks)
 - ii. Feed speed. (1 mark)
 - iii. Material removal rate. (2 marks)
 - iv. Cutting time. (1 mark)

- 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.
- Depth of thread to give 0.12 mm clearance. (2 marks)
 - Lead of thread. (1 mark)
 - Core diameter. (1 mark)
 - Helix angle of thread. (2 marks)
 - Gear ratio between the headstock spindle and lathe lead screw. (2 marks)

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)
- Reaming (1 mark)
 - Tapping (1 mark)
 - Trepanning (1 mark)
- d) Highlight **THREE** advantages of twist drills. (3 marks)
- e) Calculate the drilling torque, material removal rate and drilling power for drilling a 20 mm hole at a feed rate of 0.2 mm/rev in aluminium block with specific cutting energy of 2,000 N/mm². (4 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)