MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR SPECIAL/SUPPLIMENTARY 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^{o}; 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)