



# TECHNICAL UNIVERSITY OF MOMBASA

## DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

SECOND YEAR FIRST SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE  
IN BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING (BSME)

### EMG 2202

WORKSHOP PROCESSES & PRACTICE

### END OF SEMESTER EXAMINATIONS

**SERIES:** DECEMBER, 2013

**TIME:** 2 HOURS

#### INSTRUCTION TO CANDIDATES

1. You should have the following for this examination:-
    - Answer Booklet
    - Scientific Calculator
    - Drawing Instruments
  2. This paper consists of **FIVE** questions.
  3. Answer **ANY THREE** Questions.
  4. All Questions carry equal marks.
  5. This paper consists of **FOUR** printed pages.
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#### Question ONE

- (a) Explain the effect of varying the top rake angle. (5 marks)
- (b) (i) Name the forces acting on a lathe tool.  
(ii) With the aid of neat sketches, illustrate the forces in (i) on a turning tool.  
(iii) Explain the procedure of measuring the three forces in (i) using a dynamometer. (12 marks)
- (c) Discuss the importance of Negative rake cutting. (3 marks)

## Question TWO

- (a) Outline **FOUR** features that make the turret lathe more preferable than the centre lathe for repetitive production. **(4 marks)**
- (b) The component shown in Figure 1 is to be machined from hexagonal extruded brass rod 40mm across the flats. The capstan lathe is used for a batch size of 200 pieces:
- (i) Prepare a tooling schedule chart
  - (ii) Show the tooling arrangement in a block diagram **(14 marks)**
- (c) Explain the importance of steady box tool holders. **(2 marks)**

## Question THREE

- (a) Make a neat sketch of the twist drill and label **FIVE** parts. **(5 marks)**
- (b) With the aid of sketches explain briefly the following operations done on the drilling machine:
- (i) Boring
  - (ii) Reaming
  - (iii) Facing
  - (iv) Countersinking **(8 marks)**
- (c) A 1000 pieces of the component shown in Figure 2 are to be drilled. Design a drill jig for drilling the three holes. **(7 marks)**

## Question FOUR

- (a) With the aid of sketches briefly explain the use the following work holding devices on the shaper:
- (i) Fastening clamps
  - (ii) Stop pins
  - (iii) Vice
  - (iv) Fixture angle plate and wedge blocks. **(10 marks)**

- (b) With the aid of a sketch briefly explain the process of making a chuck key on a shaper. (7 marks)
- (c) A shaper is run to machine a piece of copper, with a speed of 24m/min and a stroke of 150mm. If the stroke ratio is 0.14, determine the number of strokes per minute that the shaper is to be run in order to do the machining. (3 marks)

#### Question FIVE

- (a) (i) Name the **THREE** types of chips formed when turning on the lathe with a single point tool.
- (ii) State any **FOUR** of the conditions under which each of the chips in (i) are formed.
- (7½ marks)
- (b) The following data were obtained from a cutting test;  $\gamma = 20^\circ$ ;  $\phi = 90^\circ$  depth of cut 6.4mm, feed 0.25mm/rev, chip length before cutting 29.4mm; chip length after cutting 13.9mm. The cutting forces were: axial force 429N, vertical force 1052N.
- Use merchant's analysis to determine:
- (i) The shear plane angle
- (ii) the friction force
- (iii) the friction angle
- (iv) the direction and magnitude of the resultant force
- (12½ marks)