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*(University of Choice)*

# MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS**

**2023/2024 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DEGREE**

**OF**

**BACHELOR OF EDUCATION IN TECHNOLOGY EDUCATION**

**COURSE CODE:** **TEM 381**

**COURSE TITLE:** **MECHANICAL TECHNOLOGY AND PRACTICE III**

**DATE:** **20/12/2023** **TIME:** **12:00 PM – 2:00 PM**

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **FOUR** questions
2. Answer Question **ONE (Compulsory)** and any other **TWO** Questions
3. All symbols have their usual meaning

**TIME: 2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over

**Question one**

a) Give any two hazards associated with each of the following machine tools
   i) Milling machine
   ii) Surface grinder (4marks)

b) Differentiate between shaping and milling machine in respect to:
   i) Cutting tool
   ii) Cutting forces
   iii) Tool and work movement (6marks)

c) Give any three factors that dictates the choice of :-
   i) A grinding wheel
   ii) A milling cutter (3 marks)

d) A certain training institution intends to order a milling machine. Give any four statements that must be in the order sheet so that the right milling machine is delivered. (4 marks)

e) With aid of sketches explain how the design of the clapper box enables the shaper to cut only on the forward stroke. (4marks)

f) Calculate the total time required to mill off 7 mm thick material from a slab by Peripheral milling given that:-
   - Number of teeth = 20
   - Feed per tooth = 0.1mm
   - Cutting speed = 100m/min
   - Ø of the cutter = 49 mm
   - Depth of cut = 2 mm
   - Length of the slab = 160 mm
   - Width of the cutter = 100mm
   - Over travel = 6 mm ( 9 marks)

**Question Two**

a) What is the difference between bench and surface grinder in respect to design and use. (4marks)

b) Structure, grit and grade are terms used in grinding wheel description. In detail explain how they influence the cutting performance of a grinding wheel. (6marks)

c) (i) Why are grinding wheels coded? (2 marks)
   (ii) A certain wheel had the following code; **A46H8V.** Fully describe the wheel. (4 marks)

d) Glazing and loading are faults that are associated with grinding wheels. Describe the occurrence of the faults and how they can be rectified. (4 marks)

**Question Three**

a) Shaping machine head can be oriented in several ways in order to acquire the desired work face orientation. With aid of sketches show and explain how the head will be oriented to:-

i) Machine vertical face
ii) Machine inclined surface (8 marks)

b) In relation to shaping machine :-
i) What is meant by the term feed (1 mark)
ii) Explain using sketches or otherwise how the feed can be raised or lowered in a shaping machine (7 marks)

c) Illustrate any four work holding method for a shaping operation. (4 marks)

**Question Four**

a) Identify and sketch the two principal milling techniques giving the characteristics of each. (10 marks)

b) A round shaft for a particular use is to have 48 straight splines cut on its periphery. The machinist can access a Brown & Sharpe indexing head supplied with
i) Change gears:- 24 (2 off), 28, 32, 40, 44, 47, 56, 64, 72, 86, 100.
ii) Index plate:-
- Plate 1: with 15, 17, 18, 19, 20.hole circles
- Plate 2: with 21, 23, 27, 29, 31, 33. Hole circles
- Plate 3: wth 37, 39, 41, 43, 47, 49. Hole circles

Describe how the differential indexing for the splines will be carried out. Include sketch of the gear set up to enable the correct indexing. (10 marks)