



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMM 216: WORKSHOP PROCESSES & PRACTICE III

DATE: 24/7/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS)

- a) Highlight **FOUR** advantages of MIG welding process. (4 marks)
- b) Given the following sets of index plates shown below for milling operation, obtain the indexing for 73 divisions. (6 marks)
 - i) Plate No. 1: 15, 16, 17, 18, 19, 20 holes.
 - ii) Plate No. 2: 21, 23, 27, 29, 31, 33 holes.
 - iii) Plate No. 3: 37, 39, 41, 43, 47, 49 holes.
- c) List and explain **TWO** artificial abrasive materials used in grinding and polishing operations (6 marks)
- d) In a cylindrical grinding operation, grinding wheel of 300 mm diameter and 20 mm width is rotating at 2,400 rpm and work-piece of diameter 75 mm rotating at 60 rpm. Grinding velocity is 1,500 m/min and table feed is 1 m/min. Take pitch of abrasives on periphery of grinding wheel as 30 mm and factor for negative rake angle of abrasive grains as 5. Assume specific cutting energy as 1,000 N/mm² and grinding depth of cut of 0.04 mm. Determine mean chip thickness, main grinding force, grinding power, feed power, volumetric removal rate and specific power consumption. (6 marks)
- e) Explain the principle of operation of spot welding using a neat sketch. (6 marks)

- f) List **FOUR** advantages of spot welding process. (2 marks)

QUESTION TWO (20 MARKS)

- a) Using a neat sketch describe any **FOUR** main parts of a vertical milling machine. (8 marks)
- b) Enumerate **SIX** advantages of gear hobbing as compared to gear milling. (6 marks)
- c) Using neat sketches, illustrate **THREE** basic types of oxyacetylene flames used in oxy-fuel-gas welding and cutting operations. (6 marks)

QUESTION THREE (20 MARKS)

- a) Enumerate **FOUR** characteristics of a grinding wheel. (2 marks)
- b) Describe the working principle of a plain cylindrical grinder using a neat sketch. (8 marks)
- c) Using neat sketches describe the following milling operations. (4 marks)
- i. Dove-tail milling.
 - ii. Form milling.
- d) Enumerate **SIX** special features of grinding process. (6 marks)

QUESTION FOUR (20 MARKS)

- a) Describe any **TWO** types of dividing heads used in milling processes (4 marks)
- b) List **FOUR** broad classifications of milling machines (2 marks)
- c) State **FOUR** applications of gas welding. (4 marks)
- d) Explain the working principle of TIG welding process using a neat sketch. (6 marks)
- e) Calculate the cutting time for cutting 150 mm long keyway using HSS end mill of 20 mm diameter having four cutting teeth. The depth of keyway is 4.2 mm. Feed per tooth is 0.1 mm and cutting speed is 38 m/min. Assume the approach and over-travel distance as half of the diameter of the cutter and a depth of 4.2 mm can be cut in one pass. (4 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the working principle of MIG welding process using a neat sketch. (6 marks)
- b) Highlight **FOUR** differences between TIG and MIG welding processes. (4 marks)

- c) When milling a slot 20 mm wide by 100 mm long in a rectangular plate 100 mm by 200 mm, the cutting speed = 60 m/min. ;Diameter of end drill = 20 mm ; Number of flutes = 8 ; Feed = 0.01 mm/flute ; Depth of cut = 3 mm. Determine the cutting time for the operation to be completed in a single pass. (6 marks)
- d) Define the following terms as applied in machining processes. (4 marks)
- i. Milling.
 - ii. Grinding.
 - iii. Face Milling.
 - iv. Gear hobbing.