



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMM513: JIG TOOL AND FIXTURE DESIGN

DATE: 23/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) With aid of well labeled diagram, distinguish between a Jig and a Fixture (4 marks)
- b) Explain **THREE** the principles of economic design in Jigs and Fixtures (6 marks)
- c) Describe **FIVE** fundamental principles in design of Jigs and Fixtures (10 marks)
- d) Compare the role of Jigs and Fixtures on machining cost (10 marks)

QUESTION TWO (20 MARKS)

- a) Describe **FIVE** basic principles need to be followed while planning for locating blanks in fixtures (10 marks)
- b) Explain **FIVE** factors essentially need to be considered in designing for clamping the work-piece in a fixture (10 marks)

QUESTION THREE (20 MARKS)

- a) Explain and illustrate the following two Clamping method and system used in jigs and fixture

- i. general type without much consideration on speed of clamping operations (5 marks)
- ii. quick acting types (5 marks)
- b) Describe the following two primary methods of locating work from a flat surface:
 - i. Solid supports (5 marks)
 - ii. Adjustable supports (5 marks)

QUESTION FOUR (20 MARKS)

- a) Describe and illustrate the following two common type of ejectors:
 - i. Mechanical ejector (5 marks)
 - ii. Spring plunger ejector (5 marks)
- b) Explain FIVE safety features related to tool design (10 marks)

QUESTION FIVE (20 MARKS)

Five hundred guide plates must be milled to receive a locating block. The tool designer has determined three possible alternatives:

1st Alternative: Have a toolmaker, who earns Kshs120 per hour, mill the plates at a rate of 25 per hour.

2nd Alternative: Use limited tooling that costs Kshs350 in the production department. The machine operator in this department, who earns Kshs 70 per hour, can make a part every 1.2 minutes.

3rd Alternative: Use a more expensive tool that costs Kshs110 but is capable of producing a part every 24 seconds. This would be done in the production department, where a machine operator earns Kshs 70 per hour.

Which alternative should the tool designer select as the most efficient and economical?

(20 marks)