



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL ENGINEERING

MED-PR 305: ENGINEERING DESIGN 1

DATE: 4/8/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer Question one and any other Two questions.

You require drawing instruments for this examination.

1.
 - a) Differentiate between dimension tolerance and geometric tolerance. (4 marks)
 - b) Define ergonomics and list the typical considerations involved. (6 marks)
 - c) Using a sketch explain what is meant by the Ergonomic Control Loop, and label the important stages in the loop. (10 marks)
 - d) Produce two alternative display arrangements for a car fascia panel. (10 marks)
2.
 - a) Outline Two common hazards of machine to the operator. (4 marks)
 - b) Describe the following methods of machine guarding:
 - i. Fail safe design,
 - ii. Self-adjusting guard,
 - iii. Overrun device,
 - iv. Automatic guard. (16 marks)
3.
 - a) Describe the important stages in the design of a manufactured article. (12 marks)
 - b) List SIX factors, other than the basic requirements of performing the design function that must be considered to ensure its efficient operation. (4 marks)
 - c) Outline four reasons which may lead to a product re-design. (4 marks)

4. a) Describe the following terms with regard to geometric tolerancing;
- i Straightness
 - ii Flatness
 - iii Cylindricity
 - iv Concentricity
 - v True position. (10 marks)
- b) Sketch Figure 1 and indicate the following geometric tolerances to confirm to BS 308 Part 3
- i Squareness of $\text{Ø}22$ axis with the base within 0.03 mm diameter;
 - ii Concentricity of $\text{Ø}22$ with $\text{Ø}30$ within 0.04mm diameter cylinder;
 - iii Symmetry of 14 mm slot within two parallel planes 0.02 mm apart;
 - iv 70° chamfer to be true to this angle within two parallel planes 0.03 mm apart;
 - v $\text{Ø}15$ hole to be true to the position stated within 0.03 mm diameter cylinder. (10 marks)
5. With the aid of sketches, explain the working mechanism for each of the following devices:
- a) Motor vehicle windscreen wiper. (5 marks)
 - b) A speed governor. (5 marks)
 - c) A hair shaving machine. (5 marks)
 - d) Car window winding mechanism. (5 marks)