



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF METALLURGICAL ENGINEERING

DEPARTMENT OF MINING ENGINEERING

WORKSHOP PRACTICE

EMI 1206

Final Examination Paper

August 2021

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Miss M. Kanganga

INSTRUCTIONS

1. This question paper consists of 4 questions

Question 1 is compulsory

Answer any other THREE from question 2 to 5

2. Questions 1 to 5 carry 25 marks each

3. Answer each question on a new page and write as eligible as possible

Additional Requirements

Calculator

Question 1

A Safety engineering exercise involves establishing context, hazard identification, risk evaluation and control of hazards in man-machine systems that contain a potential to cause injury to people or damage to property. Using Gwanda State University, focusing on the works department, conduct a safety engineering exercise. [25]

Question 2

- a) Most accidents do not just occur, they are caused. Support this statement from a human, machinery and environmental perspective. [15]
- b) Explain why the elimination of hazards is the most effective control measure and the use of personal protective equipment is the least effective control measure. [10]

Question 3

- a) Define the following geometric attributes of parts:
 - a. Angularity [1]
 - b. Circularity [1]
 - c. Concentricity [1]
 - d. Cylindricity [1]
 - e. Flatness [1]
- b) A GO/NO-GO plug gage will be designed to inspect a 50.00 ± 0.20 mm diameter hole. A wear allowance of 3% of the total tolerance band is applied to the GO side of the gage. Determine the nominal sizes of
 - a. The GO gage [5]
 - b. The NO-GO gage [5]
- c) A drilling operation is performed on a steel part using a 12.7-mm-diameter twist drill with point angle = 118° . The hole is a blind hole with a depth of 60 mm. Cutting speed = 15 m/min and feed = 0.20 mm/rev. Determine
 - a. Cutting time of the operation [5]
 - b. Metal removal rate after the drill bit reaches full diameter. [5]

Question 4

- a) As an engineering manager, you are tasked with convincing the board of directors on purchasing a numerical control system for your engineering department to perform drilling operations. Highlight the components of the system and explain why it is a sensible investment. [15]
- b) Explain the modes by which a cutting tool can fail in machining. [10]

Question 5

- a) Explain the concept of reliability in maintenance and how it can be improved. [10]

- b) Explain the following computer based maintenance systems which can be implemented in a company:
- a. Job card system [3]
 - b. Spare part life monitoring system [3]
 - c. Spare parts tracking system [3]
- c) Considering cost and labor utilization, in a tabular format compare the following types of maintenance: Reactive, Preventive and Predictive. [6]