NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

Bachelor of Engineering Honours Degree Industrial and Manufacturing Engineering

COURSE: WORKSHOP TECHNOLOGY II

COURSE CODE: EIE 1203

Second Semester Main Examination Paper

September 2024

This examination paper consists of 3 printed pages.

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**None**
Examiner's Name:	**Destine Mashava**

INSTRUCTIONS AND INFORMATION TO THE CANDIDATE

1. **The question paper contains six (6) questions from two sections.**
2. **Answer a total of four (4) questions from the two sections.**
3. **Answer not more than two (2) questions from each section**
4. **Each question carries 25 marks.**
5. **Ensure neatness and legibility of work.**

SECTION A: METAL JOINING PROCESSES

QUESTION 1

a) Describe with the aid of examples the importance of material joining processes [4]
b) Outline the considerations in selecting metal joining methods? [3]
c) Give a description of the following with the aid of sketches
   i. Bolt [2]
   ii. Screw [2]
   iii. Self-tapping screw [2]
d) Differentiate between a stud and a rivet. [2]
e) Give four (4) functions of washers in metal joining processes. [4]
f) Describe the reflow soldering process. [3]
a) Describe the safety precautions to be observed in soldering. [3]

QUESTION 2

a) Describe the three mechanism that contribute to the strength of an adhesive joint. [3]
b) Outline the conditions required to achieve effective adhesion on adhesive joints. [3]
c) Describe adhesive joints design considerations with the aid of sketches. [6]
d) Outline the advantages and disadvantages of adhesive bonding over riveting. [4]
e) Describe three (3) methods in adhesive application for mass produced products. [3]
f) Identify and describe any three (3) defects of brazed joints. [3]
g) Differentiate between reversed and straight polarity in DC arc welding. [3]

QUESTION 3

a) Why is inert gas required in Tungsten Inert Gas (TIG) welding process? [1]
b) Identify the flux material and its function in arc welding. [1]
c) With the aid of neat sketches describe electron beam welding (EBW). [5]
d) Describe any two (2) solid-state welding processes with the aid of neat sketches. [6]
e) Differentiate between the following brazing processes
   i. Dip and Infrared brazing [2]
   i. Resistance and Induction brazing [2]
   ii. Torch and furnace brazing [2]
f) Describe the following welding processes
   i. Submerged arc welding (SAW) [2]
   ii. Electrogas welding (EGW) [2]
   iii. Oxy-acetylene Welding (OAW) [2]

SECTION B: AUTOMOTIVE ENGINEERING

QUESTION 4

a) Why is maintenance engineering important to an Engineering Professional? [2]
b) State any five (5) causes of equipment failure. [5]
c) Identify and describe any five (5) maintenance strategies that you can recommend for a newly built power plant. [10]
d) Differentiate between diesel and petrol engine with the aid of neat sketches. [8]

QUESTION 5

a) What is a Controller Anti-lock Brake (CAB)? [2]
b) Identify the area of application of air brakes and give two (2) advantages and two (2) disadvantages of their application. [6]
c) State the function of the following cooling system components
   i. Radiator [1]
   ii. Thermostat [1]
   iii. Pressure cap [1]
d) Identify the materials used to manufacture the following
   i. Piston rings [1]
   ii. Heater core [1]
   iii. Engine block [1]
   iv. Crank shaft. [1]
e) Describe the difference in the area of application of disk brakes and drum brakes. [2]
f) Differentiate between drum brakes and disk brakes with the aid of neat sketches. [8]

QUESTION 6

a) What do you understand by the term "hybrid vehicle"? [2]
b) Identify and describe the engine lubrication system types. [5]
c) Explain the operation principle of two stroke engine with the aid of neat sketches. [8]
d) State and describe motor vehicle cooling system types. [5]
e) Identify and describe the innovations in automotive engineering meant to curb greenhouse effects. [5]

End of Examination Paper