NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

BENG HONOURS DEGREE IN INDUSTRIAL & MANUFACTURING ENGINEERING

ASSET MANAGEMENT

EIE 3125

FIRST SEMESTER EXAMINATION PAPER

DECEMBER 2024

This examination paper consists of **four (4)** printed pages.

Time Allowed: **3 hours**

Total Marks: **100**

Examiner's Name: **W. TUMBUDZUKU**

INSTRUCTIONS AND INFORMATION TO CANDIDATE

1. Answer any FIVE **(5)** Questions.
2. Each Question carries a total of 20 Marks.
3. Start the answer to each full question on a fresh page.
4. Ensure neatness and legibility of work.

QUESTION 1

(a) Define:

i. Assets. [1]

ii. Risk. [1]

iii. Asset management. [2]

(b) What are the objectives/ importance of asset management? [5]

(c) With reference to the equipment in your organisation describe the **Asset Life Cycle Cost Analysis.** [6]

(d) Describe the asset management maturity graph in an organisation. [5]

QUESTION 2

(a) Demonstrate your understanding of **Predictive Maintenance** with relevant examples of application. [5]

(b) Determine how the following maintenance performance factors can be evaluated:

i. Analysis of plant availability. [3]

ii. Analysis of cost of maintenance. [3]

iii. Analysis of breakdowns **[MTTF].** [3]

iv. Frequency of breakdowns **[MTTR]** [3]

v. Analysis of mean waiting time **[MWT].** [3]

QUESTION 3

Describe the following types of maintenance training programs:

(a) Multi-skilled technician programs. [3]

(b) Maintenance management courses. [3]

(c) Customised maintenance training programs. [3]

(d) Performance test training. [3]

(e) Web based training. [4]

(f) Computer based training. [4]

QUESTION 4

For the successful spare parts management, it is essential to analyse the spare parts inventory based on various characteristics.

(a) Describe the following commonly used inventory analysis methods:

i. **FSN** analysis. [2]

ii. **VED** analysis. [2]

iii. **SDE** analysis. [2]

iv. **HML** analysis. [2]

(b) Table Q4 shows then stationery basic consumption at an institution.

Table Q4 ABC analysis

Item	Annual units consumed	Cost per unit (USD$)
A	21 000	0.52
B	10 000	0.5
C	16 000	0.5
D	50 000	1.5
E	15 000	3.5
F	40 000	0.1
G	80 000	2.0
H	12 000	0.03
I	15 000	0.05
J	10 000	1.5

Perform an **ABC** inventory analysis as follows:

i. Determine the items inventory value. [3]
ii. Sort items according to the inventory value. [2]
iii. Determine the value contribution as a % of the total inventory value. [3]
iv. Using a graph (Pareto analysis), group all items according to their contribution to the overall inventory value. [4]

QUESTION 5

(a) Define Reliability as it apply to Asset Management. [2]
(b) Describe a basic approach that is followed in order to conduct a basic Failure Mode and Effect Analysis **FMEA**. [10]
(c) Demonstrate how the calculation of the Overall Equipment Effectiveness **(OEE)** is a vehicle to towards fighting the six big losses in an organisation. [8]

QUESTION 6

(a) What is Total Productive Maintenance **(TPM)** and mention the major steps in introducing **TPM** in an organisation. [5]
(b) Mention two similarities and two differences between (Total Quality Management **(TQM)** and **TPM.** [4]
(c) Under the pillars of TPM , show an understanding of the use of:
    i. 5**S** and [3]
    ii. Office **TPM** . [3]
(d) Discuss the main difficulties faced in the implementation of **TPM** in an organisation. [5]

QUESTION 7

Determine the following **PRIEL'S** indices for maintenance effectiveness.

(a) Manpower efficiency. [3]

(b) Incentive coverage. [3]

(c) Overdue tasks. [3]

(d) Degree of scheduling. [3]

(e) Maintenance ratio for investments. [3]

(f) Machine utilization. [2]

(g) Breakdown severity. [3]

End of examination !!!