

PAPER NO:333/25/M02A-HOUSEKEEPING AND ACCOMODATION STUDIES
(THEORY)

SECTION A- COMPULSORY-(40-marks)

QUESTION 1

- a) Outline any five (5) techniques in which hazards can be identified within biomedical and electrical engineering worksites. (10 marks)
- b) With the aid of diagram, demonstrate the hierarchy of risk control in biomedical and electrical engineering. (20 marks)
- c) Describe any four (4) mitigatory measures to ergonomic hazards at workplaces. (8 marks)
- d) Explain the main reason for preventing ergonomic hazards. (2 marks)

SECTION B-(60 marks)-Choose any three (3) questions from this section.

QUESTION 2

- a) Describe any five (5) biohazard waste disposal systems. (10 marks)
- b) Outline any two (2) safety rules for electrical equipment and live connections. (2 marks)
- c) Demonstrate the four (4) main methods of extinguishing fire. (8 marks)

QUESTION 3

- a) Explain why good housekeeping is considered the key in sustaining safety and health of biomedical and electrical worksites. (10 marks)
- b) Demonstrate how any five (5) of the 7s can be applied in performing housekeeping in biomedical and electrical fields. (10 marks)

QUESTION 4

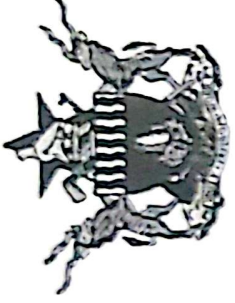
- a) Show a five (5) step by step emergency communication protocol for dealing with emergencies at workplaces. (10 marks)
- b) Clearly describe any five (5) documents essential in the application of quality management systems (QMS) in biomedical/electrical fields. (10 marks)

PAPER NO:333/25/M02A-HOUSEKEEPING AND ACCOMODATION STUDIES
(THEORY)

QUESTION 5

- a) Demonstrate how any five (5) quality management control tools can be applied in biomedical /electrical worksites. (10 marks)
- b) Assess any five (5) environmental protection measures applicable to the biomedical /electrical engineering practices. (10 marks)

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**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
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**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

**IN
BIOMEDICAL ENGINEERING**

**MODULE: Biomedical Equipment Decommissioning PAPER NO: 450/22/M10
And Inventory Maintenance**

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer all questions in Section A.
2. Answer any three (3) question in Section B.
3. Do not write your name on the answer booklet.
4. Do not write anything on this question paper.

This paper consists of 3 printed pages.

PAPER NO:450/22/M10- BIOMEDICAL EQUIPMENT DECOMMISSIONING AND INVENTORY

SECTION A-Answer all questions

QUESTION 1

- a) Define the following;
- i) Medical device (3 marks)
 - ii) Biomedical equipment decommissioning. (2 marks)
- b) Describe the importance of decontamination during biomedical equipment decommissioning. (5 marks)

QUESTION 2

- a) What is circuit isolation. (3 marks)
- b) Explain leakage current, giving appropriate examples. (3 marks)
- c) State four (4) methods of disconnecting biomedical equipment. (4 marks)

QUESTION 3

- a) Discuss the purpose of the following documents;
- i) Bin cards (3 marks)
 - ii) Store ledger (3 marks)
- b) State and describe two (2) types of medical equipment inventory. (4 marks)

QUESTION 4

- a) Sketch an illustration of the product life cycle of a biomedical equipment. (4 marks)
- b) Describe each stage in part A. (16 marks)

PAPER NO:450/22/M10- BIOMEDICAL EQUIPMENT DECOMMISSIONING AND INVENTORY

SECTION B-Answer any three (3) questions.

QUESTION 5

- a) State and explain the characteristics of a clearing agent.
- b) Discuss the difference between sterilisation and disinfection.
- c) list the factors that influence the cleaning of biomedical equipment.
- d) Using practical examples explain the process of disinfection and its application in the decontamination of biomedical equipment.

QUESTION 6

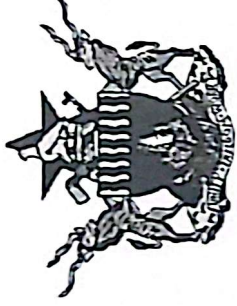
- a) Explain the LIFO, FIFO methods of inventory management. (6 marks)
- b) Explain how to resolve discrepancies between physically counted inventory and recorded inventory. (6 marks)
- c) State types of tags used for biomedical equipment's. (4 marks)

QUESTION 7

- a) Define the term biomedical equipment feasibility study. (3 marks)
- b) Give a detailed description a feasibility study for decommissioning an X- ray machine. (12 marks)
- c) Describe the standard operational procedure for decontaminating a biomedical equipment during decommissioning. (5 marks)

QUESTION 8

- a) Define for medical waste. (3 marks)
- b) Describe the five (5) categories of medical waste. (10 marks)
- c) List the hazards that can arise from poor management of medical waste. (7 marks)



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NATIONAL CERTIFICATE

IN

BIOMEDICAL ENGINEERING

MODULE: Electrical and Electronic 1 PAPER NO: 450/22/M05 / 1
Principles

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Non programmable scientist calculator.

INSTRUCTIONS TO CANDIDATE

1. Section A: Answer ALL questions. 50 marks.
2. Section B: Answer ANY TWO (2) questions. Each question carries 25 marks. 50 marks

SECTION A

QUESTION 1

- (a) State any five basic units and their symbols. (5 marks)
- (b) Define the unit of measurement of force and give the relationship between power and force. (2 marks)
- (c) A mass of 1000kg is raised through a height of 10m in 20s. what is
- (i) Workdone (2 marks)
- (ii) The power developed (2 marks)
- Take $g = 9.81\text{m/m}^2$

QUESTION 2

- (a) Ann ECG machine consumes 1.8MJ when connected to a 250V supply for 30 minutes. Find the power rating of the ECG and the current taken from supply. (6 marks)
- (b) In industry, two of the most common measuring instruments are the voltmeter and the ammeter. Distinguish between the two based on use, connection convention and expected resistance of each. (3 marks)

QUESTION 3

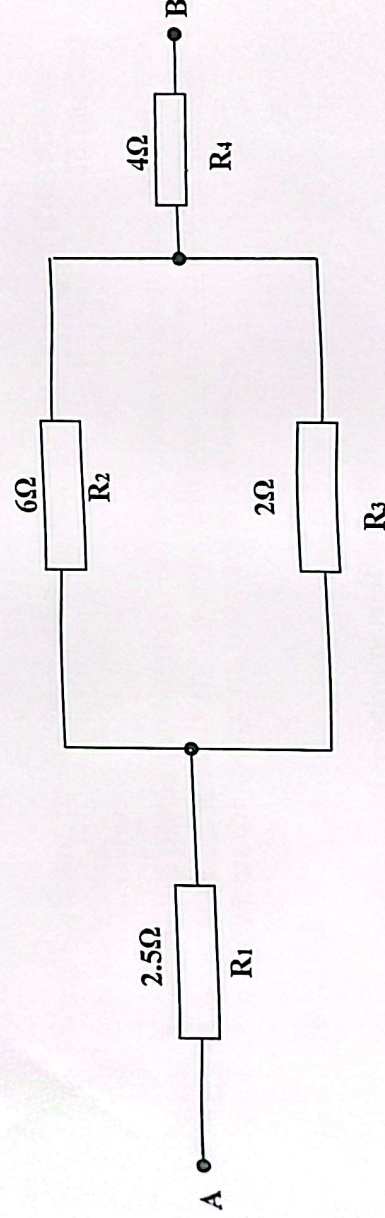
- (a) Define Ohm's law. Sketch a well labelled block circuit diagram to determine ohm's law. Use the right symbols for all the components. (8 marks)
- (b) For an ohmic conductor, determine the p.d which must be applied to a 2k Ω resistor in order for a current of 10mA to flow. (2 marks)
- (c) The resistance of an electrical conductor depends on four factors. State the four factors and how each affects resistance. (2 marks)

QUESTION 4

- (a) A coil of copper wire has a resistance of 200 Ω at 20°C. A current is passed through wire and the temperature rises to 90°C .
- Determine the resistance of the wire at 90°C correct to the nearest ohm, assuming that the temperature coefficient of resistance is 0.004/°C at 0°C. (5 marks)
- (b) Determine the values of resistors with the following colour codes
- 9i) orange – orange – black- blue-green (1 mark)
- (iii) Resistor marked or 47KK (1 mark)

QUESTION 5

- (a) Batteries tend to be split into two categories, primary and secondary batteries. What is the main differences between the two? (2 marks)
- (b) A lead -acid cell is a typical secondary cell. Briefly describe the chemical processes that occur during charging and discharging in a lead-acid cell. (4 marks)
- (c) Four cells, each with an internal resistance of 0.4Ω and an emf of $2.5V$ are connected in series to a load of 38.4Ω determine the current flowing in the circuit and the p.d at the battery terminals. (5 marks)
- (d) For the following series -parallel connection,. Determine the total circuit resistance. (4 marks)



SECTION B

QUESTION 6

- (a) State Faraday's laws and Lenz's law of electromagnetic induction. (6 marks)
- (b) A rectangular coil of sides 12cm and 8cm is rotating in a magnetic field of flux density 1.4T, the longer side of the coil is actually cutting this flux. The coil is made up of 80 turns and rotates at 1200rev/min
- (i) Calculate the maximum generated emf.
- (ii) If the coil generator 90V, at what speed will the coil rotate is rev/min. (7 marks)

QUESTION 7

- (a) What is meant by the term electric flux density, and give the units of measurement. (3 marks)
- (b) Two parallel plates having a p.d of 200V between them are spaced 0.8mm apart. What is the electric field strength? Find also the flux density when the dielectric between the plates is
- (i) Air
- (ii) Polythene of relative permittivity 2.3
- [take $\epsilon_0 = 8.85 \times 10^{-12}$]. (9 marks)

- (c) What capacitance must be connected in series with a $30\mu F$ capacitor for equivalent capacitance to be $12\mu F$. If a d.c voltage of 100V is connected, what is the

(i) Total change

(ii) p.d across each capacitor

(8 marks)

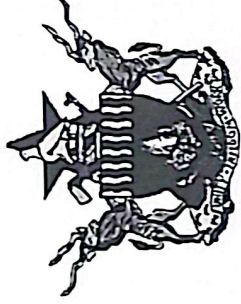
QUESTION 8

- (a) Transistor can be used as amplifiers when connected in three basic modes i.e common emitter, common collector and common base. Draw well labelled transistor diagrams to show these modes. (9 marks)

PAPER NO: 450/22/M05/1 – ELECTRICAL AND ELECTRONIC PRINCIPLES

- (b) A transistor operates with a collector current of 100mA and an emitter current of 102mA. Determine the value of the base current. (2 marks)
- (c) Draw symbols to represent the following types of diodes with “a” as anode and “k” as cathode and “g” as gate;
- | | | |
|-------|-----------------|-----------|
| i) | Rectifier diode | |
| (ii) | Zener diode | |
| (iii) | Thyristor | (3 marks) |
- (d) Bipolar transistors (BJTs) comprise of n-p-n or p-n-p junctions. Draw a cross section of a typical p-n-p transistor, clearly labelling the base, emitter and collector. (6 marks)

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**HIGHER EDUCATION EXAMINATIONS COUNCIL
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NATIONAL CERTIFICATE

IN

BIOMEDICAL ENGINEERING

SUBJECT: Biomedical Equipment Maintenance PAPER NO: 450/22/M08

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Question paper contains five (5) questions.
2. Each paper carries 25 marks.
3. Candidates are instructed to answer four (4) questions only.

This paper consists of 3 printed pages.

This paper consists of 3 printed pages.

QUESTION 1

Describe equipment used for testing whether a machine is performing according to the set standard, for each of the following measurements/performance objectives:

- a) Temperature (6 marks)
- b) Blood pressure (6 marks)
- c) Heart beat rate (6 marks)
- d) Presence germs and or harmful microbes (Disinfection) (7 marks)

QUESTION 2

- a) Define preventive maintenance and outline the major purpose thereof. (5 marks)
- b) Describe general management of Medical equipment, giving examples where possible. (20 marks)

QUESTION 3

Describe solutions thereof and hazards associated with maintenance of the following equipments.

- a) MRI machine (8 marks)
- b) X ray machine (8 marks)
- c) CT scan machine (9 marks)

QUESTION 4

- a) After a detailed and proper maintenance of the following equipments describe the paper test procedure for the functionality of each of the equipment below;

- i) Autoclave machine (9 marks)
- ii) Dialysis machine (9 marks)
- iii) Baby/infant warmer (4 marks)
- b) Define the term equipment calibration giving examples. (3 marks)

PAPER NO: 450/22/M08 – BIOMEDICAL EQUIPMENT MAINTENANCE

QUESTION 5

- a) Outline the dangers of poor maintenance of biomedical equipments. (8 marks)
- b) Outline what distinguishes Class III equipments from Class II equipments and vice versa. (4 marks)
- c) To what extent does irregular maintenance patterns affect equipment performance. (3 marks)
- d) Discuss factors affecting biomedical equipment maintenance in Zimbabwe. (10 marks)

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IN

BIOMEDICAL ENGINEERING

MODULE: Human Anatomy and Physiology PAPER NO: 450/22/M04

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer all questions from Section A.
2. Answer any three (3) questions from Section B.
3. Do not write your name on the answer script.
4. Do not write anything on the question paper.

This paper consists of 3 printed pages.

SECTION A

QUESTION 1

a) Define the following terms:

- i) Homeostasis (2 marks)
- ii) Neuron (2 marks)
- iii) Physiology (2 marks)
- iv) Plasma (2 marks)

b) Describe the six levels of organisations of the human body. (12 marks)

QUESTION 2

- a) State and explain any five (5) functions of the skeletal system. (10 marks)
- b) Outline any five (5) organs of the digestive system. (5 marks)
- c) Establish any five (5) functions of the saliva. (5 marks)

SECTION B

Answer any three (3) questions.

QUESTION 3

- a) Describe the two (2) main divisions of the nervous systems. (6 marks)
- b) Outline the enzymes and functions found in the following digestive organs:
 - i) Mouth (2 marks)
 - ii) Stomach (2 marks)
 - iii) Small intestines (2 marks)
 - iv) Pancreases (2 marks)
- c) Describe the process of exhalations (3 marks)
- d) List three (3) layers of tissue of the heart. (3 marks)

PAPER NO: 450/22/M04 – HUMAN ANATOMY AND PHYSIOLOGY

QUESTION 4

- a) Describe the gross structure of the human kidney. (10 marks)
- b) Describe the female reproductive organs: any (5) and list their functions. (10 marks)

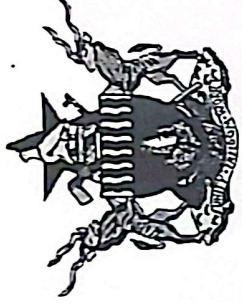
QUESTION 5

- a) Describe the audio system of the human body. (10 marks)
- b) Describe a nerve impulse. (10 marks)

QUESTION 6

- a) Describe the process and steps involved in the formation of urine. (15 marks)
- b) Give five (5) examples of glands of the endocrine system. (5 marks)

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IN

BIOMEDICAL ENGINEERING

MODULE: Electrical and Electronic 1 PAPER NO: 450/22/M05 / 1
Principles

DURATION: 3 Hours

JUNE 2026 EXAMINATION

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Non programmable scientist calculator.

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SECTION A

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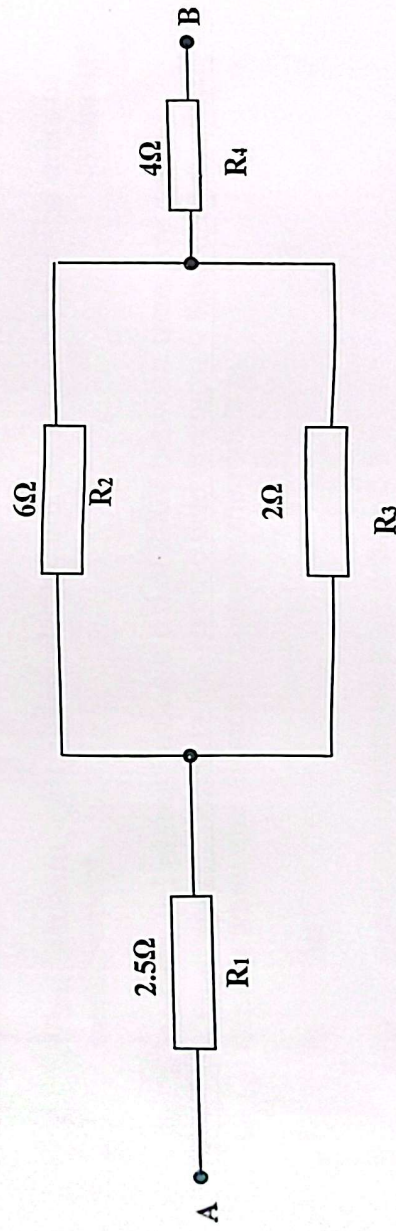
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QUESTION 5

- (a) Batteries tend to be split into two categories, primary and secondary batteries. What is the main differences between the two? (2 marks)
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SECTION B

QUESTION 6

- (a) State Faraday's laws and Lenz's law of electromagnetic induction. (6 marks)
- (b) A rectangular coil of sides 12cm and 8cm is rotates in a magnetic field of flux density 1.4T, the longer side of the coil actually cutting this flux. The coil is made up of 80 turns and rotates at 1200rev/min
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- (c) What capacitance must be connected in series with a $30\mu F$ capacitor for equivalent capacitance to be $12\mu F$. If a d.c voltage of 100V is connected, what is the

(i) Total change

(ii) p.d across each capacitor

(8 marks)

QUESTION 8

- (a) Transistor can be used as amplifiers when connected in three basic modes i.e common emitter, common collector and common bas. Draw well labelled transistor diagrams to show these modes. (9 marks)

PAPER NO: 450/22/M05/1 – ELECTRICAL AND ELECTRONIC PRINCIPLES

- (b) A transistor operates with a collector current of 100mA and an emitter current of 102mA. Determine the value of the base current. (2 marks)
- (c) Draw symbols to represent the following types of diodes with “a” as anode and “k” as cathode and “g” as gate;
- i) Rectifier diode
 - (ii) Zener diode
 - (iii) Thyristor
- (3 marks)
- (d) Bipolar transistors (BJTs) comprise of n-p-n or p-n-p junctions. Draw a cross section of a typical p-n-p transistor, clearly labelling the base, emitter and collector. (6 marks)

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NATIONAL CERTIFICATE

IN

BIOMEDICAL ENGINEERING

MODULE: Biomedical Equipment Repairs PAPER NO: 450/22/M09

DURATION: 3 hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Question paper has five (5) questions.
2. Each question carries 25 marks.
3. Candidates instructed to answer four (4) questions only.
4. Do not write your name and/or surname on the answer sheet.

This paper consists of 3 printed pages.

QUESTION 1

- a) Describe three (3) stages of troubleshooting in biomedical engineering. (12 marks)
- b) State seven (7) causes of electrical and electronic breakdowns in biomedical engineering. (7 marks)
- c) Outline six (6) signs of a mechanical problem. (6 marks)

QUESTION 2

Being the technician in charge you have been tasked with troubleshooting. The following faults on a hybrid baby warmer and resuscitator unit. Identify the possible cause and propose possible solutions for each fault.

Number	Fault reported	Possible cause	Solution
1	Unit completely unresponsive	[4 marks]	[4 marks]
2	Explanation lamp not working	[2 marks]	[2 marks]
3	Machine has leakage current	[2 marks]	[3 marks]
4	Failing to produce heat	[1 mark]	[2 marks]
5	Continuous power failure alarm	[1 mark]	[1 mark]
6	Continuous probe failure alarm	[2 marks]	[1 mark]

QUESTION 3

- a) Heat sinks are a common feature on electrical power circuits. Explain their importance. (9 marks)
- b) State parameters associated with the following components:
- i) Inductor (3 marks)
 - ii) Switch (3 marks)
 - iii) Relay (3 marks)
 - iv) Capacitor (3 marks)
- c) i) Outline tools used for replacement of electronic components. (2 marks)
- ii) State two (2) hazards associated with the components in c(i). (2 marks)

QUESTION 4

- a) Describe the functionality test for the following components:
- i) Transformer (4 marks)
 - ii) Capacitor (3 marks)
 - iii) Relay (3 marks)
 - iv) Diode (3 marks)
 - v) Cables (2 marks)
- b) i) Outline the final test conducted on an equipment after electronic/electrical repair. (6 marks)
- ii) Explain the exception for the test in b(i) in line with the expected findings. (4 marks)

QUESTION 5

- a) Describe hazards associated with the following equipment:
- i) CT scan machine (4 marks)
 - ii) MRI machine (4 marks)
 - iii) X-ray machine (4 marks)
- b) Outline the mitigation prescribed for four (4) of the hazards identified in part (a). (8 marks)
- c) State five (5) tools used for calibration. (5 marks)

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NATIONAL CERTIFICATE

IN

BIOMEDICAL ENGINEERING

**MODULE: Biomedical Equipment Decommissioning PAPER NO: 450/22/M10
and Inventory Maintenance**

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- 1) This paper contains two (2) sections: A and B.
- 2) Section A carries 40 marks, answer all questions in section A.
- 3) Each question in section B carries 20 marks answer any three (3) of the four questions in section B.
- 4) Do not write your name or surname on the question paper and or answer booklet.

This paper consists of 3 printed pages.

PAPER NO: 450/22/M10-BIOMEDICAL EQUIPMENT DECOMMISSIONING AND INVENTORY MAINTENANCE

SECTION A: ANSWER ALL QUESTIONS (40 MARKS)

QUESTION 1

Define the following terms:

- a) Medical device (3 marks)
- b) Decommissioning (3 marks)
- c) Sterilisation (2 marks)
- d) Disinfection (2 marks)

QUESTION 2

- a) Define leakage current. (2 marks)
- b) State any six (6) causes of leakage current. (6 marks)
- c) Outline the importance of documentation during safety inspections. (2 marks)

QUESTION 3

- a) Explain the term tagging (3 marks)
- b) State and describe three (3) latest innovations used for tagging inventory. (6 marks)
- c) Name five (5) product details that can be attached to a tag. (5 marks)
- d) Define the term "register" in terms of inventory management. (2 marks)
- e) Describe the importance of registers in inventory management. (4 marks)

SECTION B: ANSWER THREE (3) OUT OF FOUR (4) QUESTIONS (60 MARKS)

QUESTION 4

- a) Define coding when recording equipment data. (2 marks)
- b) Describe any three (3) technological methods used when coding data. (6 marks)
- c) Outline any three (3) methods of stores layout. (6 marks)

PAPER NO: 450/22/M10-BIOMEDICAL EQUIPMENT DECOMMISSIONING AND INVENTORY MAINTENANCE

- d) Explain the purpose of any three (3) documents that are used in the receipt of goods. (6 marks)

QUESTION 5

- a) Explain the importance and purpose of recording inventory data. (5 marks)
- b) Describe any two (2) methods of recording inventory data. (4 marks)
- c) Outline the procedure that is followed when carrying out stock take. (5 marks)
- d) Describe three (3) types of inventory found in a medical facility. (6 marks)

QUESTION 6

- a) Explain the following properties that are associated with ideal cleaning agents when disinfecting biomedical equipment:
- i) Emulsification (2 marks)
 - ii) Saponification (2 marks)
 - iii) Peptisation (2 marks)
 - iv) Water softening (2 marks)
 - v) Surfactation (2 marks)
- b) Clearly outline any three (3) factors that affect the cleaning of biomedical equipment. (6 marks)
- c) Explain the concept of ducting with the aid of practical examples. (4 marks)

QUESTION 7

- a) Define the term medical waste. (2 marks)
- b) State any five (5) classes of medical waste and give examples of each. (10 marks)
- c) State any three (3) that can be used to reduce medical waste. (3 marks)
- d) List any three (3) advantages and two (2) advantages of treating medical waste by incineration. (5 marks)
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