ZIMBABWE

MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

MODULE: Occupational Health Safety PAPER NO: 395/22/M02

DURATION: 3 Hours

MAY/JUNE 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer ALL questions in Section A.
2. Answer ANY THREE (3) questions from Section B.
3. Do not write anything on the question paper.
4. Do not write your name on the answer book.

This paper consists of 3 printed pages.

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PAPER NO: 395/22/M02 – OCCUPATIONAL HEALTH AND SAFETY

SECTION A **40 marks**

Answer ALL questions.

QUESTION 1

(a) Define the following term:-

(i) Accident (1 mark)

(ii) Safety culture (3 marks)

(iii) Occupational safety and health (3 marks)

(iv) Safety management systems (3 marks)

(b) Delineate the National Pension and Benefits Scheme under the following variables:-

(i) Membership (2 marks)

(ii) Contributions (2 marks)

(iii) Coverage (3 marks)

(iv) Benefits (3 marks)

QUESTION 2

(a) Define the Horrock's apparatus and briefly explain how it is used. (4 marks)

(b) State any four sources of water. (4 marks)

(c) Outline any four housing standards. (12 marks)

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SECTION B **60 MARKS**

Answer ANY THREE (3) questions.

QUESTION 3

Establish any five mandates of occupational health and safety as a discipline. (20 marks)

QUESTION 4

Deduce any four sources of pollution and the impact of pollution to public health. (20marks)

QUESTION 5

(a) Describe the ABC principles of First Aid. (15 marks)

(b) Illustrate the fire triangle / tetrahydron. (5 marks)

QUESTION 6

(a) List any four types of radiation. (4 marks)

(b) Outline any four importance of nutrition programmes in Zimbabwe. (12 marks)

(c) State any four noise controlling measures. (4 marks)

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HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

SUBJECT: Environment and Health PAPER NO: 395/20/S05

DURATION: 3 Hours

NOVEMBER/ DECEMBER 2022 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

Answer ALL questions

This paper consists of 2 printed pages.

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QUESTION 1

(a) Explain the following terms:

(i) Water borne disease (3 marks)

(ii) Water quality (3 marks)

(iii) Water hardness (3 marks)

(iv) Chlorine demand (3 marks)

(v) Residual chlorine (3 marks)

(b) Describe fully the criteria for healthful housing. (10 marks)

QUESTION 2

(a) Write brief notes on any one adverse effects of heat on human health. (5 marks)

(b) Symptoms of the adverse effects chosen. (5 marks)

(c) First aid to be administered on the victim. (5 marks)

QUESTION 3

Discuss air pollution under the following subheadings

(a) sources of air pollution (4 marks)

(b) effects of air pollution (4 marks)

(c) prevention of air pollution (4 marks)

(d) control of air pollution (4 marks)

QUESTION 4

Discuss in detail the role played by the public health laboratory in disease control and prevention. (20 marks)

QUESTION 5

Describe fully the techniques to be used to soften hard water. (20 marks)

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HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

SUBJECT: Introduction to Epidemiology PAPER NO: 395/20/S06

DURATION: 3 hours

NOVEMBER/DECEMBER 2022 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

Answer all questions.

This paper consists of 7 printed pages.

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SECTION A

QUESTION 1

Which of the following is the strength of a Colent study?

A. Rare disease
B. Bias can be minimised
C. Temporal relationship can be established
D. Relative risk can be calculated.

QUESTION 2

Constant presence of a disease in an area during a period of time is a:

A. Pandemic
B. Endemic
C. Epidemic
D. Sporadic

QUESTION 3

PNMR refers to:

A. Past neonatal mortality rate.
B. Post natal mortality rate.
C. Perenatal mortality rate
D. Prenatal mortality rate

QUESTION 4

A baby is called exclusively breast feed if one or his is breast feed up to:

A. 2 – 3 months
B. 3 – 4 months
C. 3 – 5 months
D. 6 months

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QUESTION 5

The vector responsible for malaria is:

A. Mosquito
B. Bugs
C. Tsetse fly
D. Sand flies

QUESTION 6

MDS stands for:

A. Medical Development Group
B. Millennium Development Goals
C. Master Development Goals
D. Management Development Goals

QUESTION 7

Helensiki declaration was about:

A. Women's rights
B. Ethics on research
C. Human rights
D. Gender issues

QUESTION 8

In an observational study there is no:

A. Sample size
B. Research ethics
C. Neither randomisation nor control
D. All the above

QUESTION 9

In the definition of epidemiology, "determinants" generally include:

A. Agents, causes, control measures and risk factors.
B. Causes, risk factors and sources.
C. Control measures
D. Risk factors

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QUESTION 10

..... refers to measures that are applied to prevent transmission after the disease has occurred.

A. Prevention
B. Vaccine
C. Control
D. Risk factors

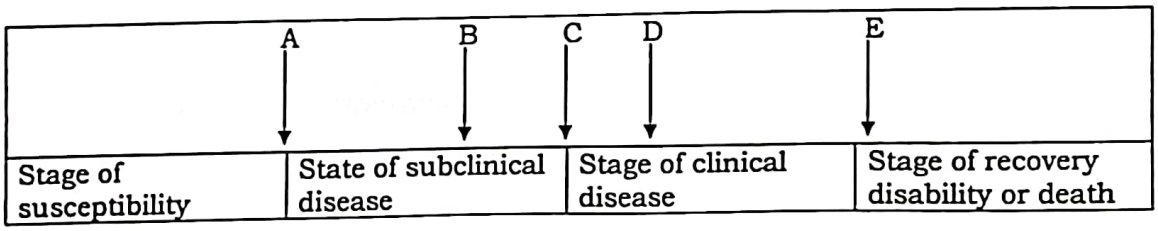
QUESTION 11

Measures taken to promote optimum health or provide specific protection of target groups against disease and injury are ..... measures.

A. Primodial
B. Prevention
C. Secondary
D. Tertiary

For each of the following, identify the appropriate letter from the timeline in Figure 1 representing the natural history of disease.

Figure 1: Natural history of disease



QUESTION 12

Onset of symptoms.

QUESTION 13

Usual time of diagnosis.

QUESTION 14

Exposure.

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QUESTION 15

A reservoir of an infectious agent can be:

A. A symptomatic human
B. An animal
C. The environment
D. All the above

QUESTION 16

Indirect transmission does not include which of the following?

A. Sexual intercourse
B. Mosquito-borne
C. Food borne
D. Door knobs or toilet seals

QUESTION 17

Disease control measures generally are not directed at which of the following?

A. Eliminating the reservoir
B. Eliminating the vector
C. Eliminating the host
D. Interrupting mode of transmission

QUESTION 18

Epidemiologists are interested in learning about:

A. The causes of disease and how to cure or control them.
B. The frequency and geographical distribution of diseases.
C. The casual relationships between diseases.
D. All the above.

QUESTION 19

The following are not modifiable risk factors.

A. Poor directory practices
B. Physical inactivity
C. Family history
D. Smoking

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QUESTION 20

On ..... the Director General of WHO (World Health Organisation) declared the Corona virus disease (COVID-19) outbreak to be a global public health emergency of international concern under the International Health Regulations (2005).

A. 30 June 2020
B. 30 January 2020
C. 30 June 2019
D. 30 January 2019

SECTION B

QUESTION 21

List the interventions you would introduces in the prevention of cervical cancer in your community using all its levels of prevention. (16 marks)

QUESTION 22

An epidemic may result from: (List the factors). (5 marks)

QUESTION 23

Sketch and explain a longitudinal study that seeks to investigate a rare exposure. (6 marks)

QUESTION 24

List the disadvantages of a case control study. (5 marks)

QUESTION 25

Factors involved in the transmission of communicable diseases. (5 marks)

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QUESTION 26

Compare and contrast communicable and non-communicable diseases. (8 marks)

QUESTION 27

Distinguish between prevention and control of communicable diseases. (4 marks)

QUESTION 28

What are the differences between passive and active immunisation. (4 marks)

QUESTION 29

State and describe six (6) barriers to immunisation. (12 marks)

QUESTION 30

Draw and label an epidemiologic triad. (6 marks)

QUESTION 31

Why is the RCT regarded as the gold standard trial for evaluating the effectiveness of interventions. (4 marks)

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HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

MODULE: Health Promotion PAPER NO: 395/22/M01

DURATION: 3 Hours

OCTOBER / NOVEMBER 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

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

This paper consists of 3 printed pages.

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SECTION A

Answer all questions.

QUESTION 1

a) Define the following terms:

i) Health (2 marks)
ii) Health promotion (2 marks)
iii) Prioritisation (2 marks)
iv) Community participation (2 marks)
v) Social action (2 marks)

b) Outline any five (5) factors to consider when designing a health related message. (10 marks)

QUESTION 2

a) List any five (5) elements of culture. (5 marks)

b) Briefly explain on any five (5) causes of social inequalities. (15 marks)

SECTION B

QUESTION 3

Analyse the assertion that the concept of health is multi-dimensional. (20 marks)

QUESTION 4

a) Write concise notes on the following types of evaluation used in public health.

i) Formative (2 marks)
ii) Process (2 marks)
iii) Summative (2 marks)

b) Outline any five (5) characteristics of an effective change agent in public health. (10 marks)

c) Distinguish culture lag and culture lead. (4 marks)

QUESTION 5

Explore any five (5) types of societies. (20 marks)

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QUESTION 6

a) List any five (5) roles of health extension workers. (5 marks)

b) Briefly explain on any five (5) social determinants of health. (15 marks)

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HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

MODULE: Occupational Health and Safety PAPER NO: 395/22/M02

DURATION: 3 Hours

OCTOBER / NOVEMBER 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

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

This paper consists of 4 printed pages.

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SECTION A

QUESTION 1

a) Write concise notes on the following approaches to hazard identification?

i) Team – work (2 marks)
ii) Pro-active (2 marks)
iii) Re-active (2 marks)

b) Outline five (5) characteristics of a safety culture? (10 marks)

c) Highlight any four (4) priorities of a first aider? (4 marks)

QUESTION 2

a) Define the following terms

i) Pollution (2 marks)
ii) Water hardness (2 marks)
iii) Over crowding (2 marks)
iv) Health (2 marks)
v) Safety (2 marks)

b) State any four (4) effects of global warming on human health. (4 marks)

c) Briefly explain the water purification cycles at household level. (6 marks)

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SECTION B

QUESTION 3

a) With aid of clearly labelled diagram illustrate the fire triangle/tetrahedron? (5 marks)

b) Complete the fire classification table?

Fire class	Fire type / description	Type of extinguisher(s)
A	?	?
B	?	?
C	?	?
D	?	?
K	?	?

(10 marks)

c) What are the five (5) steps involved in risk assessment process? (5 marks)

QUESTION 4

a) Evaluate the four (4) components of a safety management system?

i) safety policy,
ii) safety risk management,
iii) safety assurance
iv) safety promoting (12 marks)

b) Outline four (4) benefits of a formalised Health and Safety management system? (8 marks)

QUESTION 5

Explore the following waste disposal methods citing their pros and cons.

a) Landfilling (5 marks)

b) Incineration (5 marks)

c) Recycling (5 marks)

d) Composting (5 marks)

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QUESTION 6

a) Outline the impact of the following on human health.

i) Cold (3 marks)
ii) Radiation (3 marks)
iii) Malnutrition (3 marks)

b) Briefly explain any three (3) source of pollution. (6 marks)

c) State any five (5) preservation methods. (5 marks)

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MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

MODULE: Health Promotion **PAPER NO: 395/22/M01**

DURATION: 3 Hours

MAY/JUNE 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer ALL questions in Section A.
2. Answer ANY THREE (3) questions form Section B.
3. Do not write your name anywhere on the booklet.
4. Do not write anything on the question paper.

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PAPER NO: 395/22/M01 – HEALTH PROMOTION

SECTION A **40 MARKS**

Answer ALL questions.

QUESTION 1

(a) Define the following terms:-

(i) Health (2 marks)

(ii) Health promotion (2 marks)

(iii) Society (2 marks)

(iv) Culture (2 marks)

(v) Health education (2 marks)

(b) List any four types of appeals in health communication. (4 marks)

(c) Outline any three types of training. (6 marks)

QUESTION 2

(a) Highlight any five factors affecting human behaviour. (10 marks)

(b) Briefly explain any five barriers to effective communication (10 marks)

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PAPER NO: 395/22/M01 – HEALTH PROMOTION

SECTION B **60 MARKS**

Answer ANY THREE (3) questions.

QUESTION 3

Validate the verdict that the concept of health is multifaceted. (20 marks)

QUESTION 4

(a) Write concise notes on any three roles of social institutions. (6 marks)

(b) Name any four features of social groups. (4 marks)

(c) Identify and explain the planning process. (10 marks)

QUESTION 5

Delineate any five social determinants of health. (20 marks)

QUESTION 6

(a) Explain any three categories of social stratification. (6 marks)

(b) Compare and contrast the following

(i) Horticultural and agricultural society

(ii) Industrial and post industrial society (14 marks)

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HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

DISPENSARY ASSISTANT,
PUBLIC HEALTH,
NURSING ASSISTANT,
VETERINARY TECHNOLOGY

MODULE: Communication And Computer Applications

PAPER NO: 448/22/M02
448/23/M02

DURATION: 3 hours

OCTOBER/NOVEMBER 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer any five (5) questions.
2. Do not write anything on the question paper.
3. Do not write your name on the answer booklet .

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QUESTION 1

a) Explain how the factors given below affect the choice of a channel.

i) Speed (2marks)

ii) Confidentiality (2marks)

iii) Distance (2marks)

b) Describe the following natures of communication.

i) Interpersonal communication (2marks)

ii) Intrapersonal communication (2marks)

iii) Intergroup communication (2marks)

iv) Mass communication (2marks)

c) Give any six (6) channels of communication. (6 marks)

QUESTION 2

a) Write any five (5) advantages and five (5) disadvantages of verbal communication. (10marks)

b) Explain any 5C's of communication (10marks)

QUESTION 3

a) Explain how the following factors influence face to face communication:

i) body language (3marks)

ii) eye contact (3marks)

iii) tone (3marks)

b) State any five (5) aids to effective communication. (5marks)

c) Give any three (3) scenarios where written communication is preferred over face to face communication (6marks)

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QUESTION 4

a) List any five (5) information that should appear on a stock card a pharmacy. (5 marks)

b) Disease surveillance is defined as the ongoing systematic collection, analysis and interpretation of data about the occurrence and spread of disease in a population in relation to this definition, state any five (5) sources of disease surveillance data. (5marks)

c) Define the following terms in relation to the communication process.

i) Encoding. (2marks)

ii) Decoding (2marks)

iii) Channel (2marks)

iv) Noise (2marks)

v) Feedback (2marks)

QUESTION 5

a) Explain each of the following

i) Text data input device. (3marks)

ii) Audio data input device. (3marks)

iii) Pictorial data input device. (3marks)

iv) Networking device. (3marks)

b) Give the appropriate MS- office application for the following.

i) Spreadsheet software. (1mark)

ii) Word processing. (1mark)

iii) Communication software. (1mark)

iv) Presentation software. (1mark)

v) Database software. (1mark)

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QUESTION 6

a) Outline the importance of good communication within organisations. (10marks)

b) Give any five (5) forms of verbal communication. (5marks)

c) State any five (5) forms of written communication. (5marks)

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MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

SUBJECT: Foundation Mathematics For Public Health PAPER NO: 395/20/S01

DURATION: 3 Hours

MARCH/APRIL 2025 EXAMINATION

REQUIREMENTS

Scientific calculator.

INSTRUCTIONS TO CANDIDATE

This paper consists of 3 printed pages.

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PAPER NO: 395/20/S01 – FOUNDATION OF MATHEMATICS FOR PUBLIC HEALTH

QUESTION 1

Show that the following statements is a tautology

$[(p \Rightarrow q) \wedge (q \Rightarrow p)] \Leftrightarrow (p \Leftrightarrow q)$ (6 marks)

QUESTION 2

Show that the relation R from R to Z defined by xRy if and only if and only $x - y$ is divisible by 5, is an equivalence relation. (7 marks)

QUESTION 3

Evaluate:

$$\lim_{x \to 11} \frac{x^3 - 1}{2x^3 - 3x + 1}$$

(5 marks)

QUESTION 4

Find the gradient of the following curve at the given point, $y = 2x^2 + x + 1$ at (0,1). (4 marks)

QUESTION 5

Differentiate the following function from first principles, $f(x) = x - 1/x$. (6 marks)

QUESTION 6

(a) Find $f^1(x)$, $f^1(2)$ and $f^1(-1)$ given that $f(x) = \left(\frac{x^2+1}{x}\right)^2$ (7 marks)

(b) Sketch the graph of $y = \frac{2-3x}{x}$. (7 marks)

QUESTION 7

(a) Find V in terms of h, if $\frac{dv}{fh} = 4h^2 - h$ and $V = 2$ when $h = 1$. (5 marks)

(b) Given that $\frac{dy}{dx} = 2\left(x + 1/x^3\right)$ and that $y = 3$ when $x = 1$, find the value of y when $x = ½$. (5 marks)

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PAPER NO: 395/20/S01 – FOUNDATION OF MATHEMATICS FOR PUBLIC HEALTH

QUESTION 8

(a) Find the area bounded by the line $y = 2x - 5$, *the* x *– axis and the lines* $y = -1$ *and* $x = 2$. (8 marks)

(b) Find the area of the region bounded by the following curve and straight line

$y = (5 - x)(2 + x)$, $y = 10$. (10 marks)

QUESTION 9

(a) Use a stem and leaf diagram to compare the examination marks in two causes A and B for a class of 20 students.

A:	75	69	58	58	46	44	32	50	53	78
	81	61	61	45	31	44	53	66	47	57
B :	52	58	68	77	38	85	43	44	56	65
	65	79	44	71	84	72	63	69	72	79

(8 marks)

(b) On a particular Wednesday the sales of sugar form a supermarket consisted of 250 large packets, 210 medium packets and 225 small packets. The mass of sugar in a large packet is 1 ½ times that in a medium packet and 2 ½ times that in a small packet. Calculate the angles needed to draw a pie chart representing the total masses of sugar sold in large medium and small packets.

QUESTION 10

The table shows the weekly wages in $ of each of 100 factory workers. Calculate the mean wage and standard deviation.

Score	**Number of workers**
$200 \leq x < 250$	10
$250 \leq x < 300$	16
$300 \leq x < 375$	40
$375 \leq x < 400$	26
$400 \leq x < 500$	8

(8 marks)

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MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

MODULE: Healthcare Financing and Health Economics

PAPER NO: 395/22/M03

DURATION: 3 hours

MAY/JUNE 2024 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. Answer any five (5) questions.
2. Do not write your name on the answer script.
3. Do not write anything on the question paper.

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PAPER NO: 305/22/M03 – HEALTHCARE FINANCING AND HEALTH ECONOMICS

QUESTION 1

Elaborate the following terms as applied in health economics:

a) Opportunity cost (4 marks)

b) Utility (4 marks)

c) Scarcity (4 marks)

d) Technical efficiency (4 marks)

e) Micro-costing (4 marks)

QUESTION 2

Analyse the following terms:

a) Health financing (10 marks)

b) Health economics (10 marks)

QUESTION 3

Discuss the following concepts and how they are used to measure health outcomes and interventions.

a) QALY (10 marks)

b) DALY (10 marks)

QUESTION 4

Explain the following methods of economic evaluation:

a) Cost-minimisation analysis (5 marks)

b) Cost-effectiveness analysis (5 marks)

c) Cost-benefit analysis (5 marks)

d) Cost-utility analysis (5 marks)

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QUESTION 5

Discuss any five (5) factors that determine the demand for health care services. (20 marks)

QUESTION 6

Evaluate the WHO's health systems framework and building blocks. (20 marks)

QUESTION 7

Account on how Zimbabwe may improve its health system. (20 marks)

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MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

SUBJECT: Foundation of Mathematics **PAPER NO: 395/19/S01**

DURATION: 3 Hours

OCTOBER/NOVEMBER 2024 EXAMINATION

REQUIREMENTS

Computer, graph papers

INSTRUCTIONS TO CANDIDATE

1. **Answer all questions.**
2. **Do not write anything on the question paper.**
3. **Do not write your name on the answer booklet.**

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PAPER NO: 395/19/S01 – FOUNDATION OF MATHEMATICS

QUESTION 1

Let R be a relation from R to R defined by mRu of and only if M-n=0.
Determine whether R satisfies the following properties.

(a) Reflexive (5 marks)

(b) Symmetric (5 marks)

(c) Anti – symmetric (5 marks)

(d) Transitive (5 marks)

QUESTION 2

(a) Given the $y = x^3 + px^2 + qx + r$ passes through the point (1,1) and has turning points where x = -1 and x = 3, find the values of p, q, and r. (10 marks)

(b) Find the conditions that the curve $y = x^3 + ax^2 + bx + c$ should have

(i) two distinct stationary points

(ii) one stationary point

(iii) no stationary points

QUESTION 3

(a) Find an expression of y in terms of r, given that
$\frac{d^2y}{dx^2} = 6x - 10$ *and* $x = 1$, $y = 1$ and $\frac{dy}{dx} = 1$ (10 marks)

(b) If y is a function of x and $\frac{d^2y}{dx^2} = 3 - \frac{5}{\sqrt[3]{x}} R$, find the value of y a when $x = 8$ given that $\frac{dy}{dx} = \frac{1}{2}$ *and* $y = 5$ when $x = 1$. (10 marks)

QUESTION 4

(a) The gradient of a certain n curve at a typical point (x, y) is $4(1 - x)$.
Given that the maximum value of y on the curve is 8, find its equation. (5 marks)

(b) Evaluate $\int 6x - \frac{1}{6} x^3 \, dx$. (5 marks)

(c) Find $f(t)$ given that $f'(t)$ is equal to:

(i) $\left(\frac{2t+1}{t4}\right)^2$ (5 marks)

(ii) $\frac{(t-2)(2t-1)}{\sqrt{t}}$ (5 marks)

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QUESTION 5

(a) Find an expression of y in terms of x, given that $\frac{d^2y}{dx^2} = 6x - 10$ and that $x = 1$, $y = 1$. (10 marks)

(b) Find an expression in A in terms of h, given that $\frac{dA}{dh} = 3\sqrt{h} - \frac{1}{2\sqrt{h}}$ and A =10 when h =4. 10 marks

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MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

PUBLIC HEALTH

SUBJECT: Foundation of Mathematics PAPER NO: 395/20/S01

DURATION: 3 hours

MARCH/APRIL 2023 EXAMINATION

REQUIREMENTS

Scientific calculator

INSTRUCTIONS TO CANDIDATE

Answer all questions.

This paper consists of 4 printed pages.

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QUESTION 1

Show that the following statement is a tautology:

$ilp \Longrightarrow qj \Lambda lq \Longrightarrow rjJ \Longrightarrow lp \Longrightarrow rj$ (6 marks)

$(p \Rightarrow q) \wedge (q \Rightarrow r) \Rightarrow (p \Rightarrow r)$

QUESTION 2

Let R be a relation from R to R defined by mRu if and only if $m - n = 0$. Determine whether R satisfies the following properties.

a) Reflexive (4 marks)

b) Symmetric (4 marks)

c) Anti-symmetric (4 marks)

d) Transitive (4 marks)

QUESTION 3

Evaluate $\lim_{x-10} \frac{(x+1)^2-(x-1)^2}{2x}$ (5 marks)

QUESTION 4

If P and Q are the points in the curve $y = 3x^2$ with x –coordinate 1 and $1 + h$ respectively, find the gradient of PQ. Deduce the gradient of the tangent to the curve at P. (8 marks)

QUESTION 5

Differentiate the function $y = {}^{1}/_{x^2}$ from first principles. (6 marks)

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QUESTION 6

Given that the curve $y = x^3 + px^2 + qx + r$ passes through the point (1, 1) and has turning points where $x = -1$ and $x = 3$, find the values of p, q and r. Sketch the curve. (12 marks)

QUESTION 7

Find $f(t)$ given that $f'(t)$ is equal to:

a) $\left(\frac{2t+1}{t^4}\right)^2$ (5 marks)

b) $\frac{(t-2)(2t-1)}{\sqrt{t}}$ (5 marks)

QUESTION 8

Find an expression for y in terms of x, given that $\frac{d^2y}{dx^2} = 6x - 10$ and that $x = 1$, $y = 1$ and $\frac{dy}{\pi x} = 1$. (10 marks)

QUESTION 9

Find the areas enclosed by the x-axis and the following curves:

a) $y = (1 - x)(x + 2)$ (8 marks)

b) $y = 3x^2 - x^3$ (12 marks)

In each case, first show the regions.

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QUESTION 10

a) The following data are masses of 30 men.

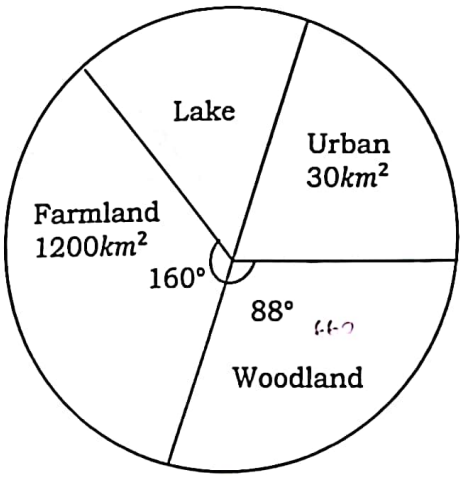
74	52,	67	68	71	76	86	81	73
68	64	75	71	61	63	57	67	57
59	72	79	64	70	74	77	79	65
68	76	83						

Correct to the nearest *kg*.

i) Using intervals 50 – 54, 55 – 59, 60 – 64 draw a Stamplot to show the masses. (5 marks)

ii) Write down the modal mass. (2 marks)

b) The pie chart which is not drawn to scale, shows the distribution of various types of land and water in a certain settlement.



Calculate the area of woodland. (4 marks)

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