



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DEPARTMENT OF INFORMATION SYSTEMS AND TECHNOLOGY

**UNIVERSITY EXAMINATION FOR THE MASTERS DEGREE IN HEALTH
INFORMATICS**

2nd YEAR 2nd SEMESTER 2024/2025 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: ICH 5120

COURSE TITLE: PROGRAMMING FOR HEALTH INFORMATICS

EXAM VENUE: STREAM: MSC (HEALTH INFORMATICS)

DATE: 24/4/2025

EXAM SESSION: 14.00-17.00

TIME: 3HOURS

INSTRUCTIONS:

- 1. Answer Question 1 (Compulsory) and ANY other two questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (20 MKS)

- a) Discuss the role of the following tools when developing healthcare applications:
- i) Assembler (3 mks)
 - ii) Interpreter (3 mks)
 - iii) Compiler (2 mks)
- b) Briefly explain why programmers need the following skills”
- i) Critical thinking (2 mks)
 - ii) Oral expression (2 mks)
- c) Data management can be defined as the process of designing data collection instruments, looking after data sheets, entering data into computer files, checking for accuracy, maintaining records of the processing steps, and archiving it for future access. Describe the significance of data management in the healthcare sector. (3 mks)
- d) Describe the goal of the following during the development and implementation of medical applications.
- i) Fast Healthcare Interoperability Resources (FHIR) (3 mks)
 - ii) Health Level 7 (HL7) (2 mks)

QUESTION TWO (20 MKS)

The HIPAA Security Rule establishes national standards to protect individuals’ electronic protected health information that is created, received, used, or maintained by a covered entity. The Security Rule requires appropriate administrative, physical, and technical safeguards to ensure the confidentiality, integrity, and security of electronic protected health information. Using appropriate illustrations, explain the following safeguards as used in this context:

- i) Administrative safeguards (7 mks)
- ii) Physical safeguards (6 mks)
- iii) Technical safeguards (7 mks)

QUESTION THREE (20 MKS)

- a) Clinical Decision Support Systems (CDSS) are computer systems designed to assist clinicians with patient-related decision making, such as diagnosis and treatment. Using relevant examples, discuss other uses of CDSS in clinical practice. (10 mks)
- b) The term interoperability describes the ability of two or more information systems or components to exchange information based on standards, and to use the information that is exchanged. Interoperability enables different HIS to work together in and across

organizational boundaries to advance the health status of individuals and communities and the effective delivery of health care to them. Describe the following levels of health information technology interoperability:

- i) Foundational interoperability (3 mks)
- ii) Structural interoperability (4 mks)
- iii) Semantic interoperability (3 mks)

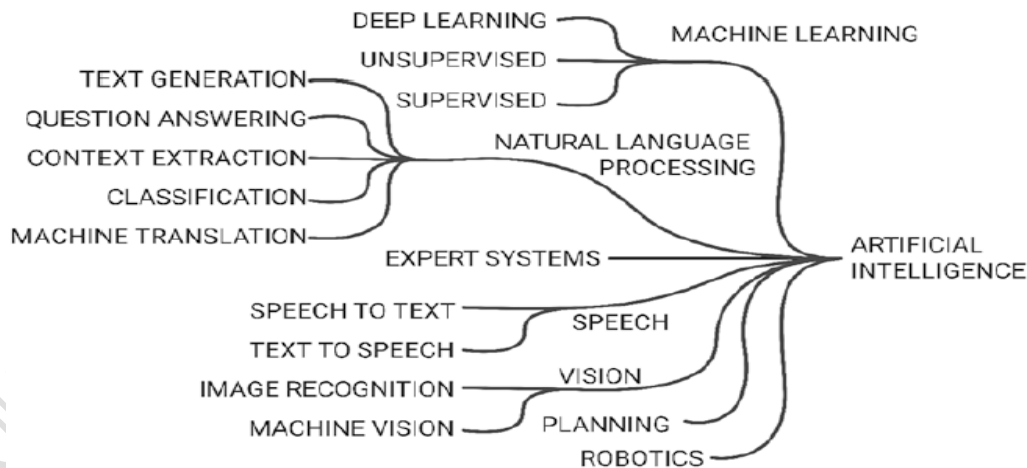
QUESTION FOUR (20 MKS)

Digital image processing deals with the manipulation of digital images through digital computers. It is a subfield of signals and systems but focus particularly on images. It focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image which is then processed using efficient algorithms. Discuss the following steps during image processing of medical images:

- i) Image acquisition (5 mks)
- ii) Image enhancement (5 mks)
- iii) Image restoration (5 mks)
- iv) Segmentation (5 mks)

QUESTION FIVE (20 MKS)

The diagram below gives an illustration of the various components of artificial intelligence.



Briefly describe the operation of the following machine learning algorithms during the analysis of big data emanating from the healthcare sector:

- i) Supervised learning (6 mks)
- ii) Unsupervised learning (7 mks)
- iii) Deep learning (7 mks)