



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

BACHELOR OF SCIENCE (APPLIED PHYSICS AND TECHNOLOGY)

SIT305: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

DATE: 12/8/2021

TIME: 2:00 – 4:00 PM

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain two machine learning problems that can be implemented in AI systems. (4 marks)
- b) Discuss the Turing test in relation to intelligent systems. (4 marks)
- c) State two types of knowledge that can be used in intelligent systems (2 marks)
- d) An Expert System has the following facts and rules

RULES

R1: IF one has at least 1 million shillings to invest AND has basic knowledge of running businesses THEN he should invest in securities.

R2: IF the persons annual income is 50 million AND has basic knowledge of running businesses THEN he should invest in stocks.

R3: IF a person is younger than 30 but older than 22 THEN he should invest in stocks.

R4: IF a person is younger than 30 but older than 22 THEN he has basic knowledge of running businesses.

R5: IF a person is wants to invest in stocks THEN he should invest KenGen shares.

FACTS:

F1: Jack has at least 1 million shillings to invest.

F2: Jack is 25 years old

Given the goal: Jack should invest in shares:

- i. Use backward chaining to validate the goal. (4 marks)
 - ii. Rewrite rules 1 and 2 in propositional logic form (2 marks)
- e) Distinguish between modus ponens and modus tollens using examples in each case (6 marks)
- f) Giant technology vendors like Microsoft and IBM have greatly contributed to developing AI platforms and applications. Explain two applications that have been used to run or develop intelligent systems. (4 marks)
- g) Draw the truth table for the following statement: (4 marks)
- $$\neg (P \wedge Q) \rightarrow \neg P \vee \neg Q.$$

QUESTION TWO (20 MARKS)

- a) Discuss how a system can be trained to do medical diagnosis through supervised learning. (8 marks)
- b) Explain any three supervised machine learning algorithms. (6 marks)
- c) You have been selected to be part of the team that is assigned the task of developing a knowledge based system. Discuss the process that you may use to develop a case based reasoning system. (6 marks)

QUESTION THREE (20 MARKS)

- a) Given the statement below:
- All citizens of Rwanda either love president Kagame or hate him
- Task:
- i. Write the statement in predicate logic (4 marks)
 - ii. Re-write the statement below using existential quantifier. (3 marks)
- b) Draw a semantic network that includes the following objects: Jane, Machakos University, Ministry of Education, KUCCPS, Machakos County. (7 marks)
- c) Explain three reasons why predicate logic is preferred to propositional logic. (6 marks)

QUESTION FOUR (20 MARKS)

- a) John has been assigned the task of deploying a robot in an industrial environment.
 - i. Explain three properties of a robot as an agent. (6 marks)
 - ii. Explain any three actuators that he can implement in the robot. (6 marks)
- b) Natural Language Processing is one of the main areas of artificial intelligence that has been widely explored. Discuss four areas of application related to NLP. (8 marks)

QUESTION FIVE (20 MARKS)

- a) Discuss the following concepts in relation to game playing. (6 marks)
 - i. Operators.
 - ii. Goal state.
 - iii. Goal test.
- b) Discuss the mini-max algorithm as used in game playing. (6 marks)
- c) Explain four types of learning in artificial intelligence. (8 marks)