



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (APPLIED PHYSICS)

SIT 305: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

DATE: 14/4/2023

TIME: 2:00 – 4:00 PM

INSTRUCTIONS: Answer Question ONE and other TWO Questions

QUESTION ONE (30 MARKS)

- a) State THREE reasoning systems that can be used to implement intelligence in AI devices. (3 marks)
- b) Distinguish between knowledge and intelligence (3 marks)
- c) Explain how an agent relates with the environment within which it operates. (5 marks)
- d) Discuss modus ponens knowledge inference technique as proposed by De' Morgan (3 marks)
- e) You have been tasked with the design of a vacuum cleaner robot (Vacbot) to be deployed at MksU. Draw a Frame that would represent the robot. (4 marks)
- f) Briefly discuss the following techniques used in Artificial intelligence.
 - i). Hill Climbing (3 marks)
 - ii). Artificial Neural Networks (3 marks)
- g) Explain three applications/ software that directly apply Natural Language Processing. (6 marks)

QUESTION TWO (20 MARKS)

- a) Discuss the Turing test. (6 marks)
- b) Explain THREE ways in which agents have been used in relation to distributed systems. (6 marks)
- c) KNEC has deployed an agent (Markbot) that is used to mark KCPE examinations. Describe the agent using the PEAS description technique. (8 marks)

QUESTION THREE (20 MARKS)

- a) Analyze the following statement using a truth table. (6 marks)
 $\neg(\neg(P \wedge Q) \rightarrow (\neg P \vee \neg Q))$
- b) Given the statement “there is someone who is liked by everybody”.
 - i. Write the statement in predicate logic. (3 marks)
 - ii. Convert the statement using alternate quantifiers while retaining the meaning. (3 marks)
- c) Draw a semantic network that includes the following objects: Jane, Machakos University, Ministry of Education, KUCCPS, Machakos County. (8 marks)

QUESTION FOUR (20 MARKS)

- a) An Expert System has the following facts and 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 person’s 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: John has at least 1 million shillings to invest.
John is 25 years old

Required:

- i. Use forward chaining to generate the status of John using the facts and rules given. (5 marks)
- ii. Use backward chaining to check whether John needs to invest in Kengen shares or not? (5 marks)
- b) Distinguish between blind search and heuristics search. (4 marks)
- c) Discuss the Mini-max Algorithm as used in game playing. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Given the 8-puzzle problem below, show how to move from the initial state to the goal state using heuristic function. (8 marks)

Initial State

1	2	3
5	6	4
8		7

Goal State

1	2	3
4	5	6
7	8	

- b) Explain three types of machine learning. (6 marks)
- c) Describe three types of knowledge. (6 marks)