



MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (IN INFORMATION TECHNOLOGY)

SIT 108: INTRODUCTION TO LOGIC

DATE: 6/5/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer **question ONE** and any other **TWO** questions.

QUESTION ONE (30 MARKS)

- a) Explain the following in logic
- i. An argument (2 marks)
 - ii. A statement (2 marks)
 - iii. Propositions (2 marks)
- b) Test the validity of each argument. (2 marks= 8 marks)
- i. If you aren't polite, you won't be treated with respect. You aren't treated with respect. Therefore, you aren't polite.
 - ii. If you are kind to a puppy, then he will be your friend. You weren't kind to that puppy. Hence, he isn't your friend.
 - iii. If you drink Surge, then you won't fall off of your skateboard. You fell off of your skateboard. Therefore, you didn't drink Surge.
 - iv. If I don't pay my income taxes, then I file for an extension or I am a felon. I'm not a felon and I didn't file for an extension. Therefore, I paid my income taxes.
- c) Name and explain the fallacy committed in the following statements (12 marks)
- i. I ought always to do what is right. I have a right to say what I think. Therefore, I ought always to say what I think.

- ii. Whenever I wear green socks my logic grade goes up. That is why I save my green socks to wear only on the days of the test.
 - iii. Einstein became a great physicist because his parents and his teachers left him alone to dream. Had they badgered him to study, he never would have gotten beyond the Swiss patent office.
 - iv. As I drove to school this morning, not one car which was turning had its turn signal on. Thus, I conclude that the drivers in this state are not well trained since they do not ever use their turn signals.
 - v. It should be no surprise to you that the state is, again, headed into either a recession or perhaps a deep economic downturn. After all, a Republican has just been elected governor.
 - vi. John Bardeen, a professor at the Advanced Institute of Physics, has gone on record to say that the American Medical Association needs to raise its standards for physicians. The opinion of a man of that brilliance should not be disregarded.
- d) For each of the following, answer the following three questions. (4 marks)
- Is the argument valid or invalid?
 - Is the argument factually correct or not factually correct?
 - Is the argument sound or unsound? (You may use the counterexample method, but are not required to.)
- i. All kangaroos live in the sea. Some dogs are kangaroos. Therefore, some dogs live in the sea.
 - ii. No diamonds are gems. All sapphires are diamonds. Therefore, all gems are sapphires.
 - iii. All residents of Boston are residents of the US. All residents of Massachusetts are residents of the US. Therefore, all residents of Boston are residents of Massachusetts

QUESTION TWO (20 MARKS)

- a) Explain the meaning of Categorical Syllogism (3 marks)
- b) Explain the components of categorical propositions (3 marks)
- c) The following are the natural language sentences; interpret them into first order logic formulas (6 marks)

- i. Not all birds can y.
- ii. If anyone can solve the problem, then Hilary can.
- d) Write the natural language interpretation of the following first order logic formulas (8 marks)

$$\neg[\exists x \text{ TakesCalculus}(x) \wedge (\forall y \text{ TakesAI}(y) \Rightarrow \text{SmarterThan}(x, y))]$$

$$\forall x \text{ Person}(x) \wedge \neg \text{Hates}(x, x) \Rightarrow \text{Hates}(\text{John}, x)$$

QUESTION THREE (20 MARKS)

- a) Establish the following claims by means of proofs in the system of Natural Deduction

$$(i) P \rightarrow (Q_1 \vee Q_2), \neg Q_1 \wedge \neg Q_2 \vdash \neg P$$

(8 marks)

- b) Show that the following argument can be transformed into a propositionally valid argument if the premises are appropriately reformulated and if premises are added on which one may naturally rely. You may use the truth table method or give a proof in Natural Deduction.

If Brown sold his old Ford, he must have used the money for a trip to the Caribbean and he must be there now. Otherwise he could only have ordered a trip to Barcelona and he must be there by now. Nobody else would buy the beaten-up banger from Brown; only Jones could have bought that old Ford. So either Jones bought Brown's Ford or Brown is in Barcelona but it can't be the case that both are true, that is, that Jones bought the Ford and Brown is in Barcelona.

(12 marks)

QUESTION FOUR (20 MARKS)

- a) In the following categorical propositions identify the quantifier, subject term, copula, and predicate term. (10 marks)

- i. Some executive pay packages are insults to ordinary workers.
- ii. No stressful jobs are occupations conducive to a healthy lifestyle.
- iii. All oil-based paints are products that contribute to photochemical smog.
- iv. Some preachers who are intolerant of others' beliefs are not television evangelists.
- v. Some artificial hearts are mechanisms that are prone to failure.

- e) Determine the type of relation that exists between the following sets of propositions P and Q. (10 marks)

1. Let P be “Today is not Friday” and let Q be “Today is Monday”
2. Let P be “Jane is not 31” and let Q be “Jane is 31”
3. Let P be “Today is Monday” let Q be “Today is Thursday”
4. Let P be “Jane is not 33” and let Q be “Jane is not 23”
5. Let Q be “Today is not Monday” and let P be “Today is Friday”

QUESTION FIVE (20 MARKS)

- a) Draw Venn diagrams for the following propositions. (12 marks)
- i. No life decisions are happenings based solely on logic.
 - ii. All electric motors are machines that depend on magnetism.
 - iii. Some political campaigns are mere attempts to discredit opponents.
 - iv. Some rock music lovers are not fans of Madonna.
- b) In the following statements, First, identify the quantity, quality, and letter name. Next, state whether the subject and predicate terms are distributed or undistributed. (8 marks)
- i. “All people that drink and drive are irresponsible people.”
 - ii. “Some roses are not red flowers.”
 - iii. “Some artificial medical devices are mechanisms that are prone to failure.”
 - iv. “No ostriches are birds that can fly.”