



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DEGREE IN
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

SIT 110: INTRODUCTION TO LOGIC

DATE: 6/6/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer Questions ONE and Any Other Two Questions

QUESTION ONE (COMPULSORY)

- a) Explain the following terms by use of a clear example (10 marks)
- i Statement
 - ii Reasoning
 - iii tautology
 - iv validity
 - v Formal logic
- b) Use the truth table method to decide whether the statement $(p \rightarrow q)$, $(\neg p \vee \neg q)$, $\neg(q \rightarrow p)$ is consistent. (7 marks)
- c) Using appropriate examples differentiate between subsets and relations (3 marks)
- d) Given the proposition $p \rightarrow q$, draw the truth tables for the following: (6 marks)
- i Converse
 - ii Inverse
 - iii Contrapositive
- e) Identify whether the following statements are true or false (4 marks)
- i All deductive argument with true premises are always valid.
 - ii All sound deductive arguments are valid.
 - iii All valid arguments have true premises and a true conclusion
 - iv All deductive arguments with true premises and a false conclusion are invalid

QUESTION TWO (20 MARKS)

- a) Given the equation $(p \vee q) \wedge \neg r) \wedge (\neg p \vee ((p \vee q) \wedge \neg r))$
- (i) Determine the DNF and CNF (5 marks)
 - (ii) Draw digital circuit diagram of the above equations (6 marks)
- b) Explain why logic alone is not a guide to truth (5 marks)
- c) Explain the following (4 marks)
- i. $\{ d: d \text{ is an animal with a heart} \}$
 - ii. Ordered pair

QUESTION THREE (20 MARKS)

- a) Describe functions and sets as used in logic using relevant examples (8 marks)
- b) Proof that $(p \rightarrow r) \vee (q \rightarrow r)$ and $(p \wedge q) \rightarrow r$ are logically equivalent (8 marks)
- d) Translate the following simple syllogistic sentences into predicate logic (4 marks)
- i Some A are not B
 - ii All human beings are mortal

QUESTION FOUR (20 MARKS)

- a) Discuss the relevance of logic to computer programmers (6 marks)
- b) Construct counter examples for the following invalid arguments (4 marks)
- (i) If Ravi is a philosopher, then Ravi is wise ($A \rightarrow B$).
Ravi is not a philosopher. $\neg A$
So, Ravi is not wise. $\neg B$
 - (ii) All who seek public office are noble.
Some who seek public office are not wise persons.
So, some wise persons are not noble.
- c) Evaluate the following Deductive and Inductive Arguments (3 marks)
- (i) Some professors wear glasses. Mr. Einstein wears glasses. Therefore, Mr. Einstein is a professor.
 - (ii) Roses are red and beautiful. Einstein was a genius. Therefore, if roses are red and beautiful, Einstein was a genius.
 - (iii) All maths teachers are over 7 feet tall. Mr. Damodhar. is a math teacher.
Therefore, Mr. Damodhar is over 7 feet tall.

- d) Given the binary string 0110 1010 1101 and 0101 0010 1111, perform (7 marks)
- (i) Bitwise OR
 - (ii) Bitwise AND
 - (iii) Bitwise XOR

QUESTION FIVE (20 MARKS)

- a) Simplify the loop below using logical equivalent (6 marks)
- ```
while((i<size AND A[i]>10) OR
 (i<size AND A[i]<0) OR
 (i<size AND (NOT (A[i]!= 0 AND NOT (A[i]>= 10))))))
```
- b) Discuss Binary relations using appropriate diagrams and examples (10 marks)
- c) Determine whether the fallacies committed by the following arguments are formal fallacies or informal fallacies. (4 marks)
- i If Rasputin was really mad, then he deceived Czar Nicholas II. Rasputin was not really mad. Therefore, he did not deceive Czar Nicholas II.
  - ii Everything that runs has feet. The Columbia River runs very swiftly. Therefore, the Columbia River has feet.
  - iii All people who believe we create our own reality are people who lack social responsibility. All people governed by selfish motives are people who lack social responsibility. Therefore, all people who believe we create our own reality are people governed by selfish motives.
  - iv The ship of state is like a ship at sea. No sailor is ever allowed to protest orders from the captain. For the same reason, no citizen should ever be allowed to protest presidential policies.