



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN**  
**INFORMATION COMMUNICATION TECHNOLOGY**  
**1<sup>ST</sup> YEAR 2<sup>ND</sup> SEMESTER 2017 ACADEMIC YEAR**  
**MAIN CAMPUS**

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**COURSE CODE: ICT 3121**

**COURSE TITLE: COMPUTER SYSTEMS FUNDAMENTALS**

**EXAM VENUE:**

**STREAM: BSC ICT**

**DATE: April 2017**

**EXAM SESSION:**

**TIME: 2 HOURS**

**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 (30 marks)

- a. Briefly explain the 5 generation of computers. (5 marks)
- b. All types of computer follows the same basic logical structure and perform the five basic operations for converting raw input data into information useful to their users.  
Using diagram explain the five basic operations showing their relationship. (6 marks)
- c. Explain how executable code is produced using compilers (4 marks)
- d. Convert the following numbers to decimal number: (6 marks)
- 101012  
125708  
19FDE16
- e. Explain the three components of the instruction cycle (6 marks)
- f. What is the role of kernel in main memory management? (5 marks)

### QUESTION TWO (20 Marks)

- a) Consider a multilevel computer in which all the levels are different. Each level has instructions that are  $m$  times as powerful as those of the level below it; that is, one level  $r$  instruction can do the work of  $m$  level  $r - 1$  instructions. If a level 1 program requires  $k$  seconds to run, how long would equivalent programs take at levels 2, 3, and 4, assuming  $n$  level  $r$  instructions are required to interpret a single  $r + 1$  instruction? (6 marks)
- b) Explain the concept of overlay and virtual memory in relation to memory management (8 marks)
- c) With the help of a well labeled diagram describe the process states (6 marks)

### QUESTION THREE (20 Marks)

- a) Consider a computer with identical interpreters at levels 1, 2, and 3. It takes an interpreter  $n$  instructions to fetch, examine, and execute one instruction. A level 1 instruction takes  $k$  nanoseconds to execute. How long does it take for an instruction at levels 2, 3, and 4? (4 marks)
- b) CPU performance has been increasing exponentially over the past decade, roughly doubling every 18 months. Parallel processing is often used to speed up CPU performance. Explain what you understand by

- i. Instruction level parallelism (2 marks)
- ii. Processors level parallelism (2 marks)
- c) Outline FOUR conditions under which a process may terminate (4 marks)

d) With the help of examples, Draw the truth tables of the following logic gates.

(8 marks)

- i. AND
- ii. OR
- iii. NAND
- iv.  $Q = \overline{A}B + A\overline{B}$ .

#### QUESTION FOUR (20 Marks)

- a) Sketch and label the structure of a four platter disk. Explain how data is read in such an arrangement. (5 marks)
- b) The transfer rate between a CPU and its associated memory is orders of magnitude higher than the mechanical I/O transfer rate.
  - i. Describe how this imbalance can cause inefficiencies (3 marks)
  - ii. Explain how it can be alleviated (3 marks)

a) With the help of brief notes, compare and contrast RISC and CISC (4 marks)

b) In addition to appearing like a single disk to the software, all RAIDs have the property that the data are distributed over the drives, to allow parallel operation. Several different schemes exist and are now known as RAID level 0 through RAID level 5. Briefly discuss how RAID 0 works. (5 marks)

#### QUESTION FIVE ( 20 Marks)

- a) Briefly discuss the importance of studying computer systems fundamentals (6 marks)
- b) Define an operating system and explain the THREE objectives of operating systems (7 marks)
- c) Outline the difference between compilation and interpretation of High language level programs in code execution (3 marks)
- d) Highlight the disadvantage and advantage of using the interpreter in code execution (4 marks)