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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR THREE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF PURE AND APPLIED SCIENCES**

 **FOR THE DEGREE OF BACHELOR OF INFORMATION SCIENCE**

**COURSE CODE: COM 320**

**COURSE TITLE: DIGITAL SYSTEM DESIGN**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 19/11/2020 TIME: 12.00-2.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

a. i. Name two advantages of digital data as compared to analog data. **(2 marks)**

 ii. Distinguish between combinational and sequential logic systems. **(3 marks)**

 iii. Use the Boolean algebra to simplify; **(3 marks)**

 F(A,B,C) = A’B$Type equation here.$ + BC’ + BC + AB’C’

b. i. Distinguish between assembly language and machine language programming for microprocessor. **(2 marks)**

ii. In digital data transmission, binary coding systems are preferred to other number

systems. State the advantages of binary system of numbers. **(2 marks)**

c. i. Using a labelled diagram explain the operation of a shift register. **(2 marks)**

 ii. What is a microprocessor? Explain the working of a microprocessor. **(4 marks)**

d. i. Given the Boolean function. Obtain a simplified expression. **(2 marks)**

 A•$\overbar{B}$ + A•($\overbar{B+C)}$ + B•($\overbar{B+C)}$

 ii. Explain using an example what is a co-processor. **(2 marks)**

 iii. Discuss three types of integrated circuits. **(3 marks)**

e. i. What is interfacing in computers? State any two types. **(3 marks)**

 ii. Identify the components of a computer system. **(2 marks)**

**QUESTION TWO (20 MARKS)**

a. i. Name the figure below and state its function. **(2 marks)**



Fig.1

 ii. What is the function of ALU? **(1 mark)**

 iii. List three types of IC technologies and name the two most widely used. **(4 marks)**

b. i. Using two input variables A and B and a truth table, prove De-Morgan’s theorems.

 **(3 marks)**

 ii. Distinguish between synchronous and asynchronous mode circuit system designs.

 **(2 marks)**

 iii. Prove the Boolean algebra; A + $\overbar{A} $B = A + B **(2 marks)**

c. i. Enumerate four features of digital integrated circuits. **(4 marks)**

 ii. Identify two types of chip packages in integrated circuits. **(2 marks)**

**QUESTION THREE (20 MARKS)**

a. i. Using a truth table and circuit diagram discuss the application of half adder circuit.

 **(5 marks)**

 ii. Identify four characteristics of sequential and combinational circuits. **(4 marks)**

b. i. What is a multiplexer? **(1 mark)**

 ii. The block diagram represents a multiplexer. Mention any two applications**. (2 marks)**



Fig. 2

c. i. Differentiate between an n-bit parallel subtractor and a decoder circuit.**(2 marks)**

 ii. Design an S-R flip flop. Explain the operation of S-R FF when the inputs S=1, R= 0

 and E= 1. **(3 marks)**

**QUESTION FOUR ( 20 MARKS)**

a. i. State and explain two types of digital counters. **(2 marks)**

 ii. State two uses of counters. **(2 marks)**

 iii. Using labelled diagrams explain the operation of a shift register. **(4 marks)**

b. Explain the operation a master-slave JK flip flop with a asynchronous set and reset

 inputs. Draw the diagram and give its truth table. **(6 marks)**

c. i. Classify counters and explain the operation when the input mode M is at logic 0

(M=0) and logic 1 (M=1). **(4 marks)**

 ii. Discuss uses of shift registers. **(2 marks)**

**QUESTION FIVE (20 MARKS)**

a. i. State three applications of microprocessors. **(3 marks)**

 ii. Outline four measures in which processors differ from one another **(2 marks)**

b. Discuss any three technological innovations of microprocessors today. **(6 marks)**

c. i. State advantages of ICs over electronic circuits **(3 mark)**

 ii. Explain why input/output devices cannot be interfaced directly to a Microprocessor.

 **(2 marks)**

d. i. Convert the following logic gate circuit into a Boolean expression, writing Boolean

sub-expressions next to each gate output in the diagram: **(2 marks)**



Fig.3

 ii. Simplify the Boolean expression **(2 marks)**

 AB + B(B +$\overbar{C)}$ + $\overbar{B}$C