



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE
(ELECTRONIC AND COMPUTER ENGINEERING)

SCE 501: MICROPROCESSOR AND DIGITAL SYSTEMS DESIGN

DATE: Friday 3rd December 2010

TIME: 8.00a.m -10.00a.m

INSTRUCTIONS

- Answer **QUESTION ONE** and **ANY OTHER TWO** from the remaining **FOUR** questions
- **Question ONE** carries **30 marks** while the other questions carry **20 marks** each.

Question 1

- (a) State four tasks needed to be performed by the circuitry of a microprocessor interface device (4 marks)
- (b) With the aid of a timing diagram, outline the operations of a Non-Return to Zero (NRZ) two-wire output handshake. (4 marks)
- (c) (i) Define 'Monolithic Integrated circuit (IC)' as used in IC technology.
(ii) Explain how a wafer is fabricated in IC technology. (6 marks)
- (d) Describe the simultaneous method of Analogue to Digital Converter (ADC) operations. (8 marks)
- (e) Use tri-state buffers to explain how information movement across the microprocessor bus (links between microprocessor and interfaced devices) is controlled. (8 marks)

Question 2

- (a) (i) Differentiate between hybrid and integrated circuits (4 marks)
(ii) Outline the major differences between Small Scale Integration (SSI), Medium Scale Integration (MSI) and Large scale Integration (LSI) (2 marks)
- (b) State the major drawbacks of Integrated Circuits (ICs). (3 marks)
- (c) With the aid of diagrams, show how an NPN transistor is fabricated on a wafer. (11 marks)

Question 3

- (a) (i) Define prototyping in a production system.
- (ii) State any two (2) advantages and any two (2) disadvantages of prototyping. (6 marks)
- (b) With the aid of a diagram, explain the procedure of 'prototyping' in a product design process. (10 marks)
- (c) Explain the procedure of performing electronic prototyping. (4 marks)

Question 4

- (a) Explain the following terms as applied to Digital to Analogue Converters (DACs).
- (i) Accuracy
- (ii) Resolution (2 marks)
- (b) (i) Using a binary ladder network, show the voltage levels (analogue) generated by a 4-bit DAC.
- (ii) Find the output voltage from a 5 bit binary ladder that has a digital input of 10111. Assume 0=0V and 1=+10V. (13 marks)
- (c) (i) State the type of output expected from the execution of the program P4C
- (ii) State the function of the sections marked A, B, C, and D. in program P4C
- (iii) Identify the assembler directives used in the program. (5 marks)

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; Program P4C Kenyatta University      SCE 501 Microprocessor & Digital Systems Design
;-----
.model Small
.stack 64                               ;A
.data
here    db    "Hello! KU finalists. $"
again   db    "Work Harder! $"
.code
;-----
START:
mov ax, @data                           ;B
mov ds, ax
;-----
mov dx, OFFSET here
mov ah, 9
int 21H                                ;C
mov dx, OFFSET again
int 21H
;-----
mov ah, 4cH
int 21H                                ;D
end START
-----
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Question 5

- (a) Explain why testing a microprocessor chip is more difficult and challenging than testing other digital semiconductor chips. (5 marks)
- (b) With the aid of a block diagram, describe the fixed pattern of microprocessor testing (9 marks)
- (c) Use a simplified timing diagram to explain the memory READ cycle of an Intel 8086 microprocessor. (6 marks)