

CERTIFICATE IV IN ELECTRONICS ENGINEERING/STAGE II

UNIT CODE: EEE412

UNIT NAME: DIGITAL ELECTRONICS

FINAL EXAMINATION PAPER-TRIMESTER 2 - 2014

DAY:

VENUE:

TIME:

DURATION: 2hrs

INSTRUCTIONS TO STUDENTS:

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross each one through and attach these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Answers to all questions must be written in ink on the answer sheets.
9. Use of programmable calculator(s) is prohibited.
10. Attempt **ALL** questions.

SECTION-A**FILL IN THE BLANKS****[10 Marks]**

Choose the appropriate word from the list in the box to fill in the blanks on each statement below. Enter the word of your choice only in the answer sheet attached at the back of this question paper. When completed, insert the answer sheet into the answer booklet – do not rewrite the statement again.

analog, logic, flip flop, probe, analog, latch, high, low, filtered, low, digital, convertor, sampling, one, sum of product, DAC, filter, ADC, SET.

1. A(n) signal is one whose output varies continuously with the input.
2. A(n) signal is one whose output varies at discrete voltage levels.
3. A sine wave is an example of a(n) signal.
4. A square wave is an example of a(n) signal.
5. A bistable multi-vibrator is an electronic device that has 2 stable states. It is also called a
6. When the R is High and S is Low in an RS flip flop, the mode of operation is
7. An input ofV to a CMOS IC would be considered a LOW level logic.
8. A simple test instrument for detecting High, Low and Undefined digital logic levels is called a
9. In analog to digital conversion, the first step to be taken is for the analog signal to be and then sampled.
10. The unique aspect of an OR Gate is that the output is Low only when all the inputs are

(1 mark each)

SECTION-B**MULTIPLE CHOICE****[20 Marks]**

Indicate your answer by circling the letter of your choice (A), (B), (C), or (D) in the answer sheet provided. When completed, insert your answer sheet in the answer booklet.

- 1) An input of +1.5V to a TTL IC (+5V supply) would be considered a [REDACTED] logic level.
 - A) high
 - B) low
 - C) undefined
 - D) none of the above

- 2) The general name for an electronic device that translates from decimal to binary is a (n) [REDACTED].
 - A) encoder
 - B) decoder
 - C) comparator
 - D) multiplexer

- 3) The design of circuitry that translates voltages and currents between devices (such as TTL and CMOS) is called [REDACTED].
 - A) interlacing
 - B) sinking
 - C) boundary scanning
 - D) Interfacing

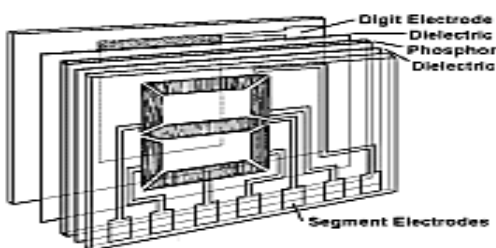
- 4) A ROM is:
 - A) Volatile memory
 - B) Non-volatile memory
 - C) Read/write memory
 - D) Electrically erasable memory

- 5) The functional capacity for ULSI devices is [REDACTED].
 - A) 12 to 99 gates.
 - B) Over 100,000 gates.
 - C) 100 to 10,000 gates.
 - D) more than 10,000 gates.

- 6) The nematic fluid sandwiched between the glass plates of a LCD is also called [REDACTED] - [REDACTED].
 - A) green phosphor
 - B) metalized segments
 - C) liquid crystal
 - D) plasma

- 7) Two types of RAM semiconductor memories are the DRAM and [REDACTED].
 - A) SRAM
 - B) TRAM
 - C) BRAM
 - D) None of the above

- 8) A binary-weighted resistor used in a digital-to-analog converter (DAC) is only practical up to a resolution of _____.
- A) 10 bits
 - B) 2 bits
 - C) 8 bits
 - D) 4 bits
- 9) Which of the following is not a TTL circuit?
- A) 74AL00
 - B) 74HC00
 - C) 74F00
 - D) 74AS00
- 10) A(n) _____ converts an analog input to a digital output.
- A) DAC
 - B) ADC
 - C) bipolar converter
 - D) flash converter
- 11) The smallest change in the analog voltage that can be represented by a digital word is known as the _____ of an ADC or DAC.
- A) resolution
 - B) linearity
 - C) conversion time
 - D) sampling rate
- 12) A troubleshooter should expect all voltage levels in a TTL circuit to be
- A) 12 V dc
 - B) Between 0.4 and 2.4 dc
 - C) Less than 0.4 or greater than 2.4 V dc
 - D) 240 V ac or zero
- 13) For a common-anode seven segment display, when the segments a, b and c are lit, the display will show the number:
- A) 1
 - B) 7
 - C) 4
 - D) 3
- 14) Identify which display is illustrated in the diagram below?



- A) LED display
- B) Plasma display
- C) Electroluminescent display
- D) Incandescent Filament display

15) A LCD consists of how many plates of glass, sealed around the perimeter, with a layer of liquid crystal fluid between them.

- A) 2
- B) 3
- C) 4
- D) 5

16) LEDs are made out of _____.

- A) silicon.
- B) germanium.
- C) gallium.
- D) silicon and germanium, but not gallium.

17) The storage element for a static RAM is the _____.

- A) diode
- B) capacitor
- C) resistor
- D) flip-flop

18) Select the statement that best describes Read-only memory (ROM).

- A) Nonvolatile, used to store information that changes during system operation
- B) Nonvolatile, used to store information that does not change during system operation
- C) Volatile, used to store information that changes during system operation
- D) Volatile, used to store information that does not change during system operation

19) What two functions does a DRAM controller perform?

- A) address multiplexing and data selection
- B) data selection and the refresh operation
- C) address multiplexing and the refresh operation
- D) data selection and CPU accessing

20) Which type of ROM can be erased by UV light?

- A) EPROM
- B) ROM
- C) EEPROM
- D) mask ROM

SECTION-C**TRUE OR FALSE****[10 Marks]**

For each of the following statements, determine if its "True" or "False". Enter your choice of answer in the answer sheet provided by circling **T** if it's true or **F** if it's False. When you finish, tear off the answer sheet, insert it in your answer booklet and secure with a string.

1. If a logic circuit has a fan-out of 5, the circuit has 5 outputs.
2. The high-state noise margin is the difference between $V_{IH}(\min)$ and $V_{OH}(\min)$.
3. A logic family with $t_{pd}(\text{avg})=12\text{ns}$ and $P_D(\text{avg})=15\text{mW}$ has a greater speed-power product than one with 8ns and 30mW.
4. The basic function of a comparator is to compare the magnitude of two binary quantities to determine the relationship of those quantities.
5. An encoder is a combinational logic circuit that essentially performs the "reverse" decoder function.
6. The basic function of a decoder is to detect the presence of a specified combination of bits (code) on its input and to indicate that presence by a specified output level.
7. A Multiplexer has a single input but many outputs.
8. A DeMultiplexer is a device that allows digital information from several sources to be routed into a single line for transmission over that line to a common destination.
9. A DAC is used to convert a digital input word into an analogue output voltage or current.
10. The majority of Light-Emitting Diodes are either Gallium Phosphide (GaP) or Gallium Arsenide Phosphide (GaAsP) devices.

SECTION-D**SHORT ANSWER QUESTIONS****[20 Marks]**

1. Which type of transistor do you find in a:
 a. TTL IC and
 b. CMOS IC?

(2 marks)

2. What are the three performance characteristics to identify any TTL IC.

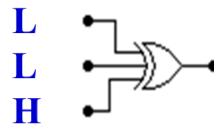
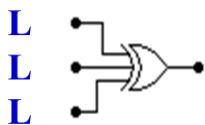
(3 marks)

3. Refer to the table below and make your analysis on the three types of gates in terms of their speed, power consumption, noise margin, fan-in and fan-out. While comparing, state which one is best to use.

(5 marks)

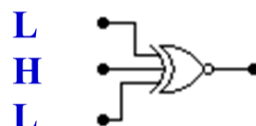
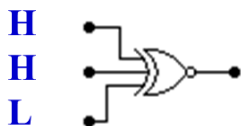
Type of Gate	Fan-in	Fan-out	Propagation delay (ns)	Noise margin (V)	Power consumption (mW)
TTL	8	10	9	0.4	40
CMOS	8	50	30	1.5	1
ECL	5	50	1.1	0.4	30

4. For the Exclusive Or Gates below, indicate the outputs:



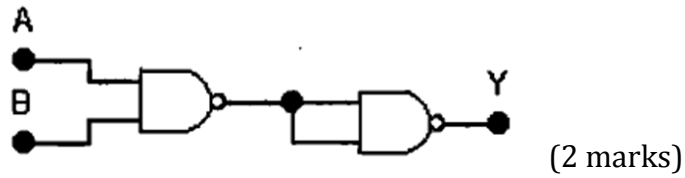
(2 mark)

5. Show the output of the Exclusive NOR Gates below considering the inputs assigned:



(2 marks)

6. Two Nand Gates are wired up below, what equivalent logic function will it produce?



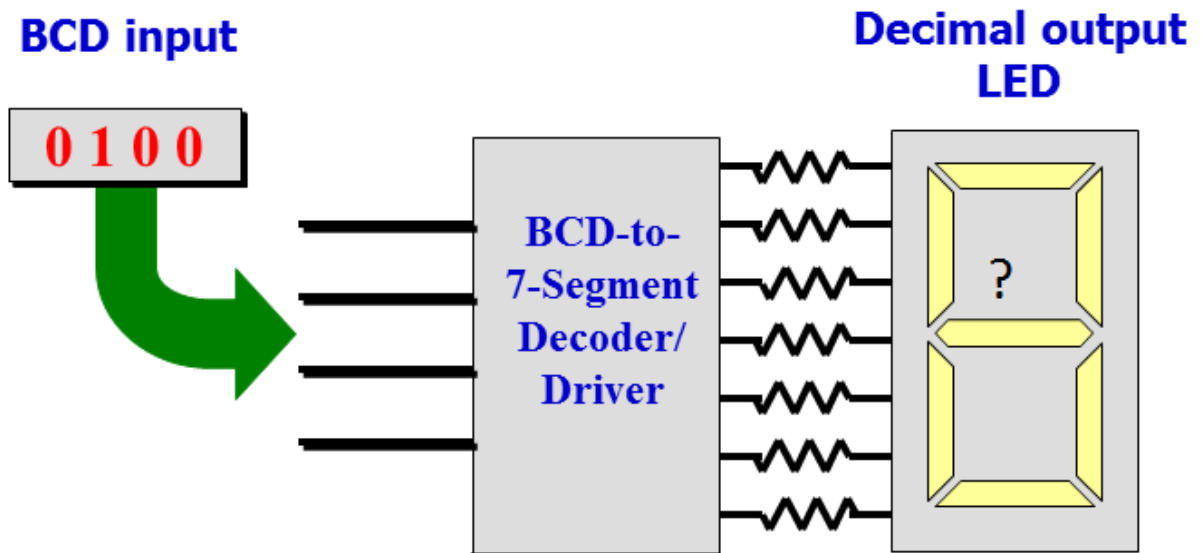
7. When doing TTL - CMOS interfacing, what is the purpose of a pull - up resistor? (1 mark)

8. What is the term referring to the drive capability of the output of a digital IC? (1 mark)

9. What is the advantage of a CMOS family of IC's over the TTL type? (1 mark)

10. Name the 7-bit code used to represent numbers, letters, punctuation marks and control characters. (1 mark)

1. Refer to the diagram below and answer the following questions.
 - i) What is the decimal output from the decoder that appears on the 7-segment display considering the inputs shown? (1 mark)
 - ii) If the BCD input is 0010, what segments will be illuminated? (1 mark)
 - iii) What special name is given to the resistors that are added between the decoder and the display? (1mark)



2. A programmable logic device (PLD) is an IC that can be programmed by the user to execute a complex logic function. There are various types of PLD's available. What do the following acronyms stand for: (3 marks)
 - i) PAL
 - ii) GAL
 - iii) FPL
3. What is the function of a multiplexer (MUX) and also draw the logic symbol for 1-of-4 multiplexer. (4 marks)
4. Draw the logic circuit for the following Boolean expressions : (3 marks)
 - (i) $Y = ABC + \bar{D}$
 - (ii) $Y = (\bar{E}G + B) H$

5. What is the purpose of the following:

i) Decoder

(1 mark)

ii) Encoder

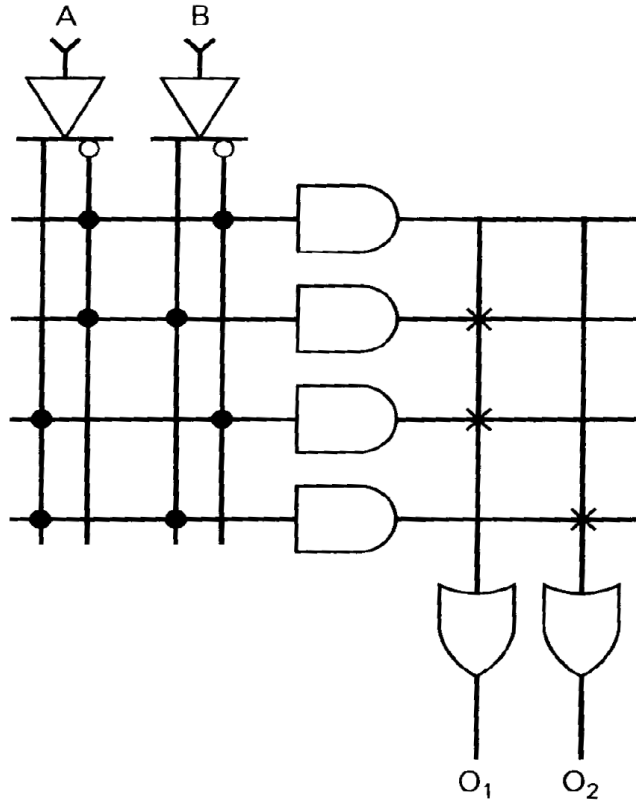
(1 mark)

iii) Demultiplexer

(1 mark)

6. Determine the Boolean equation at the 2 outputs of the given programmable logic array.

(4 marks)



7. Convert the following from one form to the other as indicated:

I. Decimal to Binary: 20_{10} , 254_{10} , 320_{10}

(3 marks)

II. Hexadecimal to Binary: 12_{16} , $4D_{16}$, $3BC_{16}$

(3 marks)

III. Binary to Hexadecimal: 1101_2 , 110011_2 , 10001011_2 , 100100100_2

(4 marks)

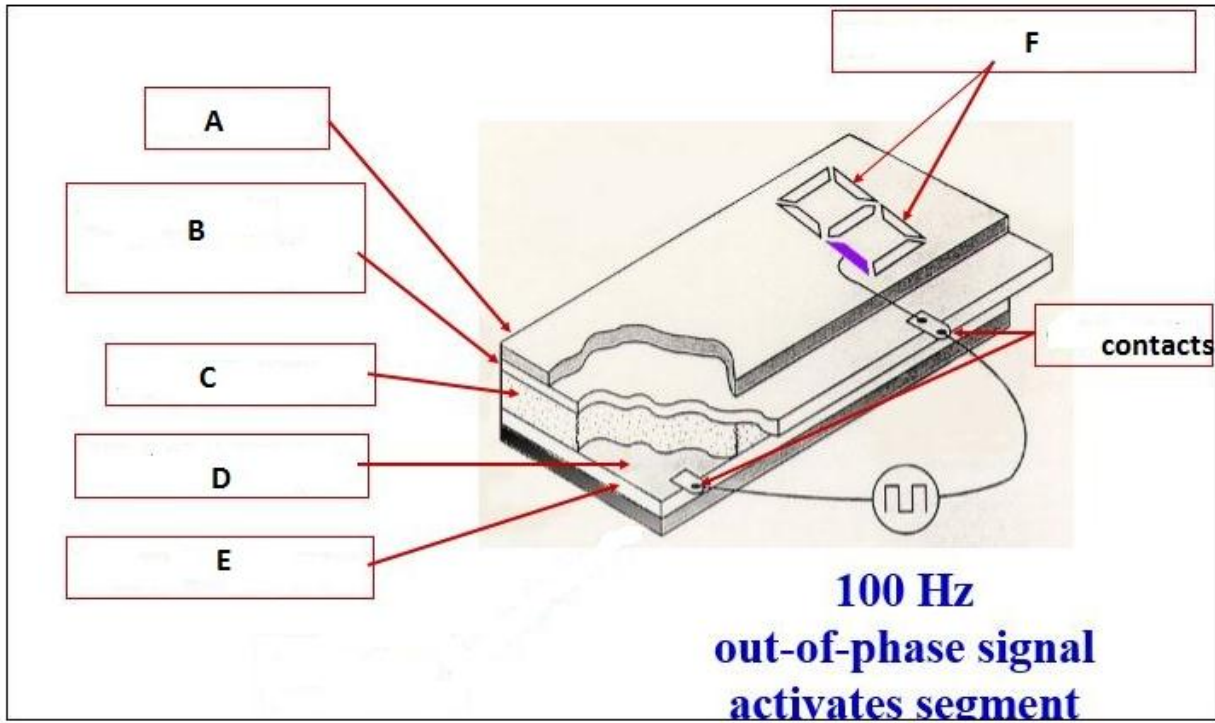
SECTION-E

DEFINITIONS- DEVICES - IDENTIFICATION

[10 Marks]

1. Identify the following parts of a liquid crystal display and label them.

(3 marks)



2. What do the following terms stand for:

(2 marks)

- (a) EPROM
- (b) PROM
- (c) SIMM
- (d) DIMM

3. Identify the following labels:

(5 marks)

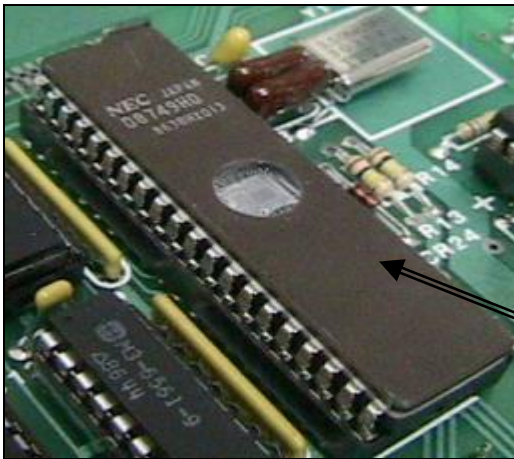


(i)

(ii)

(iii)

(iv)



(v)

End of Examination Paper

SECTION-A

FILL IN THE BLANKS

[10 Marks]

Enter your choice of words only for the statements in Section A in the table below. When completed, insert this answer sheet into your answer booklet.

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

SECTION-B**MULTIPLE CHOICE****[20 Marks]**

Indicate your answer by **circling** the letter of your choice (A), (B), (C), or (D) in the table below. When completed, insert your answer sheet into the answer booklet.

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D

11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D

If you think you made a wrong choice and would like to choose another one, cross it off (X) clearly and circle your new choice, if you want to change your mind and go back to your original choice, indicate by crossing your second choice (X) and ticking your original choice.

ANSWER SHEET – REMOVE & INSERT INTO ANSWER BOOKLET WHEN COMPLETED

SECTION-C

TRUE OR FALSE

[10 Marks]

For each of the following statements, determine if its “True” or “False”. Indicate your chosen answer in the answer sheet provided by circling (T) if it’s true or (F) is its False. When you finish, tear off the answer sheet, insert it in your answer booklet and secure with a string.

1	T	F
2	T	F
3	T	F
4	T	F
5	T	F
6	T	F
7	T	F
8	T	F
9	T	F
10	T	F

If you think you made a wrong choice and would like to choose another one, cross it off (X) clearly and circle your new choice, if you want to change your mind and go back to your original choice, indicate by crossing your second choice (X) and ticking your original choice.