

Mansoura University
Faculty of Engineering
Communications and Electronics Engineering Department

Digital Circuits 1 - Term Exam	Exam Time: 3 hours
Exam Date: June 12th, 2012	Total Marks: 70 Marks
1st year Electronics - 2nd Term	

Important Instructions:

1 This exam contains:

pages 2 & 3

25 MCQs (4 choices each) --> Mark your answer selection in the MCQ answer sheet
in the middle of the answer booklet Q1-Q25

(25 Marks)

Note: answer all questions.

each correct answer will be marked with **(+ 1) mark**.

each wrong or unanswered question will get a zero mark.

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3 Questions (technical questions) --> Write your answers in the booklet

(45 Marks)

2 No calculators are allowed in this exam.

My best wishes to YOU!

Dr. Sameh Rehan

Note: This exam has questions on both sides of the questions' sheets.

Answer the following 25 MCQs in the MCQ sheet in the answer booklet: (Total of 25 Marks)
(+ 1 Mark for each correct answer, zero Mark for each wrong or unanswered question)

- Q1 Compared to analog systems, digital systems
- ① are less prone to noise
 - ② can represent an infinite number of values
 - ③ can handle much higher power
 - ④ all of the above
- Q2 The number of values that can be assigned to a bit are
- ① one
 - ② two
 - ③ three
 - ④ ten
- Q3 The time measurement between the 50% point on the leading edge of a pulse to the 50% point on the trailing edge of the pulse is called the
- ① rise time
 - ② fall time
 - ③ period
 - ④ pulse width
- Q4 The time measurement between the 90% point on the trailing edge of a pulse to the 10% point on the trailing edge of the pulse is called the
- ① rise time
 - ② fall time
 - ③ period
 - ④ pulse width
- Q5 The reciprocal of the frequency of a clock signal is the
- ① rise time
 - ② fall time
 - ③ period
 - ④ pulse width
- Q6 If the period of a clock signal is 500 ps, the frequency is
- ① 20 MHz
 - ② 200 MHz
 - ③ 2 GHz
 - ④ 20 GHz
- Q7 AND, OR, and NOT gates can be used to form
- ① storage devices
 - ② comparators
 - ③ data selectors
 - ④ all of the above
- Q8 A shift register is an example of a
- ① storage device
 - ② comparator
 - ③ data selector
 - ④ counter
- Q9 A device that is used to switch one of several input lines to a single output line is called a
- ① comparator
 - ② decoder
 - ③ counter
 - ④ multiplexer
- Q10 For the binary number 1000, the weight of the column with the 1 is
- ① 4
 - ② 6
 - ③ 8
 - ④ 10
- Q11 The 2's complement of 1000 is
- ① 0111
 - ② 1000
 - ③ 1001
 - ④ 1010
- Q12 The fractional binary number 0.11 has a decimal value of
- ① $\frac{1}{4}$
 - ② $\frac{1}{2}$
 - ③ $\frac{3}{4}$
 - ④ none of the above

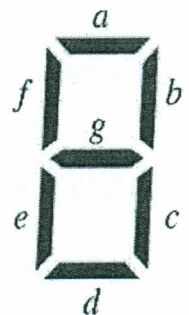
Answer the following 3 technical questions in the answer booklet: (total of 45 Marks)
(both wrong answers and unanswered questions have zero marks)

- Q1. For adder logic circuits: (total of 15 marks)
- a- draw the logic symbol and the truth table of the half-adder logic circuit. (4 marks)
 - b- draw the logic symbol and the truth table of the full-adder logic circuit. (4 marks)
 - c- implement a half-adder using simple (AND, OR, NOT) logic gates. (3 marks)
 - d- form a full-adder logic circuit using half-adders and any required gates. (4 marks)

- Q2. For the 7-segment decoding logic, a BCD number is used as the input and the 7 outputs are used to activate the corresponding segments of the display.
The arrangement of segments is as shown:

(total of 25 marks)

- a- write down the truth table (use X to represent don't care output) for all seven segments a, b, c, d, e, f, and g. (7 marks)
- b- develop the optimized sum-of-products Boolean logic expression of the "c" output segment using Karnaugh map. (6 marks)
- c- develop the optimized product-of-sums Boolean logic expression of the "g" output segment using Karnaugh map. (6 marks)
- d- develop the optimized logic circuit using appropriate gates for the logic expressions developed in the previous two questions for output segments "c" and "g". (6 marks)



- Q3. If the data-select inputs to the shown multiplexer are sequenced as shown by the shown waveforms, determine the output for the following input states:
Do = 0, D1 = 1, D2 = 1, D3 = 0

(5 Marks)

