UNIVERSITY EXAMINATIONS
EXAMINATION FOR SEPTEMBER/DECEMBER 2015/2016 FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

RCCS 101: - DIGITAL LOGIC.

DATE: 30th November-2015 TIME: 2 HOURS

GENERAL INSTRUCTIONS:
Students are NOT permitted to write on the examination paper during reading time.
This is a closed book examination. Text book/Reference books/notes are not permitted.

SPECIAL INSTRUCTIONS:
This examination paper consists Questions in Section A followed by section B.
Answer **Question 1 and any Other Two** questions.
QUESTIONS in ALL Sections should be answered in answer booklet(s).

1. **PLEASE start the answer to EACH question on a NEW PAGE.**
2. **Keep your phone(s) switched off at the front of the examination room and NOT on your person.**
3. **Keep ALL bags and caps at the front of the examination room and DO NOT refer to ANY unauthorized material before or during the course of the examination.**
4. **ALWAYS show your working.**
5. **Marks indicated in parenthesis i.e. ( ) will be awarded for clear and logical answers.**
6. **Write your REGISTRATION NO. Clearly on the answer booklet(s).**
7. **For the Questions, write the number of the question on the answer booklet(s) in the order you answered them.**
8. **DO NOT use your PHONE as a CALCULATOR.**
9. **YOU are ONLY ALLOWED to leave the exam room 30minutes to the end of the Exam.**
10. **Calculator will be required.**

SECTION A (COMPULSORY)

Question (1) - (30Marks)

a) Define the following terms? **(10 Marks)**

i. Multiplexers.
ii. De-Multiplexers.
iii. Encoder.
iv. Decoders.
v. D.S.P.

b) Using suitable truth tables prove the De-Morgan's Boolean identities. **(3 Marks)**

c) Workout the following calculations. (Show the working) **(4 Marks)**

- $BA7B_{16} + 11001100011_2$ Results in decimal number.
- $11111111_2 + 95_{10}$ Results in decimal number.

d) Implement the Boolean expression below using suitable logic gates.

$Y_{out} = [(AB)\ C + (DE)\ (FG)]$. **(3 Marks)**

e) In each of the question below, select the collect choice. **(10 Marks)**

i. What is the binary equivalent of the decimal number 368?
(A) 101110000.
(B) 110110000.
(C) 111010000.
(D) 111100000.

ii. How many Flip-Flops are required for mod–16 counter?
(A) 5.
(B) 6.
(C) 3.
(D) 4.

iii. The Gray code for decimal number 6 is equivalent to
(A) 1100.
(B) 1001.
(C) 0101.
(D) 0110.

iv. in which of the following gates, the output is 1, if atleast one input is 1
(A) NOR.
(B) AND.
(C) OR.
(D) NAND.

v. The time required for a gate to change state is reffered to as
(A) Rise time.
(B) Decay time.
(C) Propagation time.
(D) Charging time.

vi. The time required for a pulse to change from 10 to 90 percentof its maximum value is called.
(A) Rise time.
(B) Decay time.
(C) Propagation time.
(D) Operating speed.

vii. Odd parity of a word or a byte can detected using
(A) OR gate.
(B) AND gate.
(C) NOR gate.
(D) XOR gate.

viii. The Boolean expression A.B+ A.B+ A.B is equivalent to

(A) A + B
(B) A.B
(C) A + B
(D) A.B

ix. The output of a logic gate is 1 when all its inputs are at logic 0. the gate is either

(A) NAND or EX-OR.
(B) OR Gate or EX-NOR.
(C) AND or EX-OR.
(D) NOR or EX-NOR.

x. With respect to ADCs the speed of conversion is maximum in.

(A) Successive-approximation A/D converter.
(B) Parallel-comparative A/D converter.
(C) Counter ramp A/D converter.
(D) Dual-slope A/D converter.

SECTION B (Answer Any Two Questions)

Question (2) - (20Marks)

a) Differentiate between a full adder and half adder. **(4 Marks)**

b) Describe two uses of the Gray code in digital electronics. **(4 Marks)**

c) Using logic Boolean simplification or the Karnaugh mapping, simplify the Boolean expression below. **(6 Marks)**

Y Output = {$\overline{A}BC + A\overline{B}C + AB\overline{C} + ABC$}.

d) Using a suitable universal gate of your choice, implement Exclusive-OR and Exclusive-NOR gates. **(6 Marks)**

Question (3) - (20Marks)

a) Perform conversion for the following numbers, into the indicate form **(10 Marks)**

i.	257_{10}	into binary number.
ii.	3451_{8}	into decimal number.
iii.	$BAF0B_{16}$	into octal number.
iv.	11010011_{2}	into decimal number.
v.	1011111101011010_{2}	into Hexadecimal number.

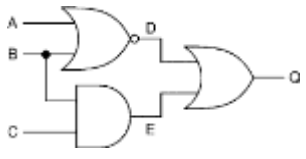
b) Given the binary number below, convert it to Gray code format. **(2 Marks)**

$11001110001_2 = X_{gray}$

c) Describe the functionalities of the following Digital circuits. **(5Marks)**

i. Memory cell.
ii. De-multiplexers.
iii. Registers.
iv. Shift Registers.
v. Counters.

d) With reference to the figure below, evaluate the Boolean expression for Q output. **(3 Marks)**



Question (4) - (20Marks)

a) Perform the following calculations. **(6 Marks)**

i. $10111011_2 + 10110111_2$ - Express the results in Decimal.

ii. $1010_2 \times 1111_2$ - Express the results in Decimal.

iii. $1111_2 - 8_{10}$ - Using twos complements.

b) Convert the following numbers as specified. **(4 Marks)**

i. 11101011_{binary} - into Gray Code.

ii. 10011101_{gray} - into Binary.

iii. 101011011101_2 - Octal number.

iv. 101010101_2 - Two's complements.

c) Using Karnaugh mapping or Boolean simplification, design a full adder circuit, and implement the circuit using suitable gates. **(10Marks)**

Question (5) - (20Marks)

a) Draw the basic logic gates, used in Digital electronics. Hence show their truth tables as well as the Boolean expressions. **(14 Marks)**

b) State the two universal logic gates and explain why they are considered universal. **(2 Marks)**

d) Apply DE Morgan's theorem to the expression below and hence show the transformation. **(2Marks)**

$$\overline{A + B + C + D}$$

e) List four Number systems used in digital electronics, showing the character ranges.

(2 Marks)