THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

B. SC. DEGREE PROGRAMME 2014/2015

FINAL EXAMINATION

CPU3141: DIGITAL COMPUTER FUNDAMENTALS

DURATION: TWO HOURS (2 HOURS)

Date: 15.10.2015	Time: 1.30 pm – 3.30 pm

Answer All Questions.

Q1.

  (i)

    a) Convert the following **decimal** number into **binary**.

      345_{10}

    b) Convert the following **binary** number to **hexadecimal**.

      1011001001111011101_{2}

    c) Convert the following **decimal** number into **octal**.

      674_{10}

  (ii) Solve following using **binary arithmetic**.

    a) $1101_{2} + 1100011_{2}$

    b) $100100_{2} - 11111_{2}$

    c) $1101101101_{2} / 110_{2}$

    d) $1101_{2} * 1000011_{2}$

  (iii) **Simplify** the following Boolean expression using **Boolean algebra rules**.

$$(A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + C)(\bar{A} + \bar{B} + \bar{C})$$

    Mention the rules used in the simplification.

  (iv) Draw the **logic circuit** for the reduced Boolean expression in Q1 (iii).

  (v) Implement the circuit of Q1(iv) using **NAND** gates only.

Q2.

(i) What is a **Binary Code**? and describe the **use** of binary codes in digital systems.

(ii) Briefly describe **Error Detection Codes**.

(iii) Convert following **Gray code** value into **binary**.

11010110

Q3.

(i) Describe the **function** of a **flip flop** using a **logic circuit** of a SR latch.

(ii) What is known as **clocking?** Describe the **clocked SR flip flop** using a **circuit diagram**.

(iii) Derive the **Truth Table** of a **JK** Flip flop and draw the corresponding **circuit** diagram, (Consider a NAND implementation)

(iv) What is the **difference** between **combinational** logic and **sequential** logic? Give an example application for each.

Q4.

(i) What is a **Register**? Briefly describe **three (03)** types of Registers.

(ii) Draw the **block diagram** of a **positive edge triggered asynchronous counter** that counts from 0 to 9 and draw the **timing diagram**.

(iii) **Analyze** the following **asynchronous sequential circuit**. (Clearly indicate the steps)
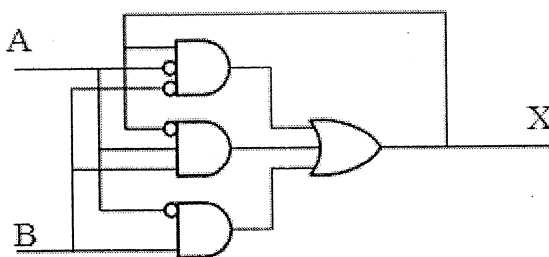
(iv) Identify the race conditions in the asynchronous circuit in Q5 (iii) and mention the steps you take to remove the race condition.

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