KIIT UNIVERSITY, BHUBANESWAR

SPRING MID SEMESTER EXAMINATION-2013

DIGITAL ELECTRONICS CIRCUITS [EC- 402]

Full Marks: 25 **Duration: 2Hrs**

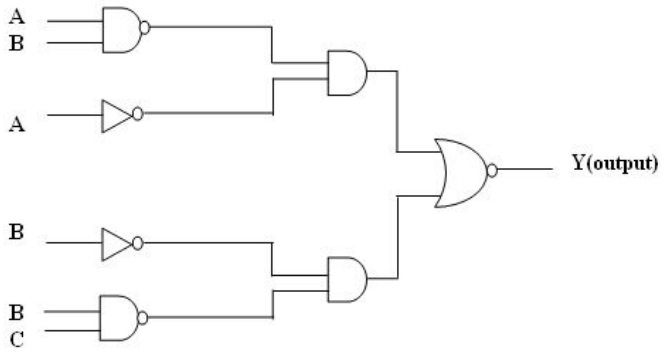
Answer any FIVE questions including question No.1 which is compulsory.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

(1) a) "Gray codes are cyclic but not sequential & self-complementing." Justify. [1x5]
b) Perform following arithmetic: (i) BCD addition (749+858),
(ii)(**-9**) **-** (**-6**) using 2's complement method.
c) Show that, $U\overline{V} + UW + V\overline{W} = U + V\overline{W}$ where U, V and W are Boolean variables.
d) Define 'Positive logic system' and 'Negative logic system'.
e) Why the row and column values of the K- map are ordered in Gray code rather than binary numerical order, explain in brief.

(2) Obtain the minimized expression for the following 4-variable Boolean expression using K-map method and implement the minimized expression using **minimum numbers of universal gates.** [5]
$$F(P,Q,R,S) = \sum m(0,1,7,10,11,12,13) + d(2,4,8,14)$$

(3) a) Design 4-bit combined adder/subtractor circuit using **full adders & XNOR gates only** and explain the working in brief. [4]
b) Define Reflective codes and explain with proper example in brief. [1]

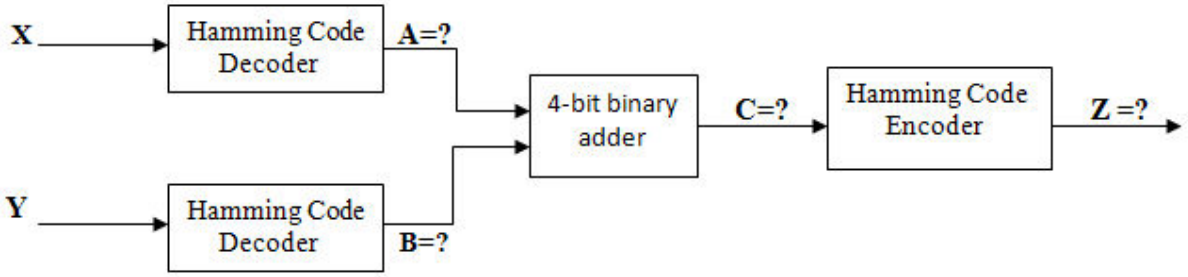
(4) a) Simplify the given logic circuit and implement the simplified expression using **only NOR gates**. [4]



b) What is the disadvantage of Ripple carry adder and how can it be minimized? [1]

(5) a) What is Decoder? Draw the circuit diagram and truth table of 2-4 decoder having active-LOW output terminals. [2]
b) In a room there are three electric lamps. For sufficient light intensity, at least two lamps must be ON at the same time. Design a circuit, using 3-8 decoder (having active HIGH output lines) and basic logic gates, which enables an alarm when light intensity in the room is not sufficient. [3]

(6) a) In the figure given below X, Y and Z are **7-bit Hamming codes**. A, B and C are **4-bit data**. [4]
where **X: 1010011**
Y: 1100101



Find **A, B, C** and **Z.** [Assume (i) even parity system (ii) at most single bit error may take place.]

b) Define 'minterm' and 'maxterm' and show that $m_i = \overline{M_i}$, [1]
(where $m_i : i^{th}$ minterm & $M_i : i^{th}$ maxterm)