INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer Any Other TWO (2) questions
TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE (COMPULSORY) (30MARKS)

a) Distinguish between the following terms
   - i. Combinational logic circuit and Sequential logic circuit
   - ii. Minterms and Maxterms

   (4 marks)

b) Convert the following to binary numbers
   - i. $(64.6875)_{10}$
   - ii. $(DF)_{16}$

   (4 marks)

c) Given two binary numbers X=1010100 and Y=1000011, perform the subtraction (a) X-Y and (b) Y-X using 2's complements

   (4 marks)

d) Prove the Consensus law $X.Y + X'.Z + Y.Z = X.Y + X'Z$

   (3 marks)

e) With an aid of a well labelled diagram, **explain** the working of a binary adder.

   (4 marks)

f) State any *three* differences between synchronous and asynchronous counters.

   (3 marks)

g) With an aid of a well labelled diagram, **discuss** the *two* types of SR Latch.

   (4 marks)

h) Define a pulse generator and give its *two* areas of application.

   (4 marks)

QUESTION TWO

a) Convert 10111011_2 to its equivalent Gray code.

   (2 marks)

b) Define an Excess-3 BCD code. State the shortcoming of the 8421 code which is overcome in the Excess-3 code. Illustrate with the help of an example

   (3 marks)

c) Using a well labeled diagram, explain the operation of multiplexers. State any *two* major limitations of Multiplexers.

   (5 marks)

d) Construct a **5:32** line decoder with four **3:8** decoders with Enables and a **2:4** line decoder. Use block diagrams for components

   (10 marks

QUESTION THREE

a) i) With the aid of a circuit diagram and a truth table, explain the working of a full subtractor. *(5 marks)*
   ii) By use of a K-map, derive the minimized SOP equations for the functions D and B_O.

   (5 marks)

b) Define a Flip Flop in relation to digital electronics. State any two differences between a Latch and a Flip Flop.

   (4 marks)

c) With an aid of an appropriate diagram, briefly discuss any *two* types of Flip Flops

(*6 marks*)

QUESTION FOUR
a) Differentiate between a register and a counter   (*2 marks*)

b) With an aid of a well labelled diagram, describe the working of a 4-bit SISO register
(*8 marks*)

c) With the help clocked JK flip flops and waveform, explain the working of a three-bit binary ripple counter. Write truth table for clock transitions.

(*10 marks*)

QUESTION FIVE
a) i) State the difference between a demultiplexer and a decoder.   (*2 marks*)
ii) Implement a **1:16** Demultiplexers using lower order Demultiplexers.

(*8 marks*)

b) Register A and B contain four D-type flip flops each triggered at the positive edge of the clock pulse. Design a digital circuit that will transfer the data from Register A to Register B with a transfer command.   (*10 marks*)