M.Sc. 2nd Semester Examination, 2010

ELECTRONICS

(*Digital Electronics*)

(Theory)

PAPER —EL-1202

Full Marks : 40

Time : 2 hours

Answer **Q.No.1** and any **three** questions from the rest

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. Answer any *five* questions : 2x5

(*a*) Define Fan-in and Fan-out of a logic gate.

(*b*) One *n*-bit binary number is given, how do you determine that this number is divisible by 4 without doing any arithmetic ?

(*c*) Explain how a Latch differs from a flip-flop.

(*d*) Write down the principle of operation of a weighted register type D/A converter.

(*e*) From the truth table of a T F/F prove that $Q(\epsilon+1) = T\,\bar{Q}(\epsilon) + \bar{T}\,Q(\epsilon)$.

(*f*) Why a NAND gate is faster than an AND gate having same number of inputs ?

2. (*a*) Realise the cost effective circuit for the function
$F = \Sigma\, m\,(2, 3, 5, 7, 10, 11, 13, 14, 15)$
using fundamental gates.

(*b*) Reduce the following Boolean expression
$f = \bar{x}\,\bar{y}\,z + yz + z$.

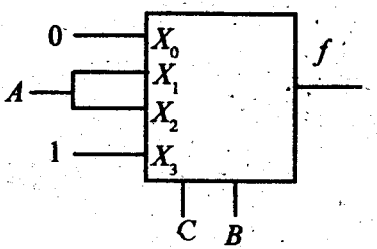
(*c*) What do mean by the dual of a digital circuit? 6 + 2 + 2

3. (*a*) What is a demultiplexer ? How does it differ from a decoder ? Implement the function

$$f = \bar{A}\,\bar{B}\,\bar{C} + A\,\bar{B}\,C + AB$$

using 3 to 8 decoder having active low outputs.

(*b*) A 4 to 1 multiplexer is connected with three logic inputs A, B, C as shown in the following figure. Find out the logical expression of f. (1 + 1 + 4) + 4



4. (*a*) What is function of clear ($\overline{CLR}$) and preset ($\overline{PRE}$) inputs of a flip-flop? Are they synchronous or asynchronous?

(*b*) Design a counting circuit using all JK flip-flops to count an event up to ten and resets to 0 and recycles again. (2 + 1) + 7

5. (*a*) Briefly explain the operation of a R-$2R$ Ladder D/A converter and derive the expression of analog output voltage.

(*b*) A 10 bit resistive devider is constructed such that the current through the LSB resistor is 100 μA. What will be the maximum current that will flow through the MSB resistor? (3 + 4) + 3

6. (*a*) What is a seven-segment display? How do you represent 7·01 using four seven-segment display?

(*b*) Design a BCD to excess-3 code converter using fundamental gates.

(*c*) Write short note on EPROM. (1 + 2) + 5 + 2