Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech**
PET3I104

3rd Semester Regular/Back Examination 2017-18
Digital Electronics
BRANCH: ECE, ETC
Time: 3 Hours
Max Marks: 100
Q.CODE: B1111

Answer Question No.1, Question No.2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

a) A device which converts BCD to seven segment is called ----------
b) A latch is _____ sensitive.
c) In 2's complement representation the number 11100101 represents the decimal number ----------.
d) A decade counter skips
  i) binary states 1000 to 1111
  ii) binary states 0000 to 0011
  iii) binary states 1010 to 1111
  iv) binary states 1111 to higher
e) The number of digits in octal system is ----------
f) In the expression A + BC, the total number of minterms will be
  i) 2
  ii) 3
  iii) 4
  iv) 5
g) BCD input 1000 is fed to a 7 segment display through a BCD to 7 segment decoder/driver. The segments which will lit up are
  i) *a, b, d*
  ii) *a, b, c*
  iii) all
  iv) *a, b, g, c, d*
h) Which of the following is non-saturating?
  i) TTL
  ii) CMOS
  iii) ECL
  iv) BOTH I & II
i) Which of the following memories uses one transistor and one capacitor as basic memory unit
  i) SRAM
  ii) DRAM
  iii) Both SRAM and DRAM
  iv) None
j) A 12 bit ADC is used to convert analog voltage of 0 to 10 V into digital. The resolution is
  i) 2.44 mV
  ii) 24.4 mV
  iii) 1.2 V
  iv) none of the above

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Convert $(11001)_2$ to grey code.
b) Differentiate between minterms and maxterms.
c) Subtract 43 from 32 using 2's complement.

d) How many flip-flops are required to make a 32-MOD binary counter?
e) Convert the fractional binary number (11101.0101) to octal and hexadecimal.
f) Realize a T-F/F from J-K F/F.
g) Simplify the given expression using Boolean algebra:

$$xy + x'y + x'y'$$

h) State De-Morgan's theorem and absorption law.
i) Explain the applications of X-OR gate.
j) What is the major advantage of ECL logic over TTL and CMOS ?

Q3 **a)** Obtain the simplified expression for the following equations: **(10)**
i) F(x,y,z) = $\sum(0,1,4,5)$
ii) F(a,b,c,d) = $\prod(0,1,2,3,4,10,11)$
iii) F(w,x,y,z) = $\sum(1,3,5,7,13,15)$

b) Implement the function $F = (AB + A'B')(CD' + C'D)$ using **(5)**
i) NAND gates
ii) NOR gates

Q4 **a)** For the given Boolean function: **(10)**

$$F = xy'z + x'y'z + w'xy + wx'y + wxy$$

i) Obtain the truth table
ii) Draw the logic diagram using original Boolean expression
iii) Simplify the function using K-map
iv) Obtain the truth table for the simplified function and show that it is same as the truth table obtained in part (i)
v) Draw the logic digram of the simplified expression

b) Implement the following function with MUX **(5)**
F(w,x,y,z) = $\sum(0,3,5,6,8,9,14,15)$

Q5 **a)** Design a 4 bit magnitude comparator circuit. **(10)**
b) A combinational circuit is defined by the following three functions: **(5)**

$$F_1 = x'y' + xyz', F_2 = x' + y', F_3 = xy + x'y'$$

Design the circuit with decoder and external gates.

Q6 **a)** What are the different types of shift register? The content of a 4-bit shift register is 1010. If the register is shifted 8 times to the right with a serial input 11010010. Explain its operation by showing the content of the register after each shift. **(10)**
b) Design a state diagram for a 3-bit down counter. Derive its state table and draw its logic circuit diagram. **(5)**

Q7 **a)** Design a state diagram for a 3-bit up counter. Derive its state table and draw its logic circuit diagram. **(10)**
b) What is a master slave flip-flop? Draw and explain the logic diagram of master slave D flip-flop using NAND gates **(5)**

Q8 **a)** Draw a circuit for BCD to excess 3 code converter and list the PLA programming table for the same. **(10)**
b) Design a combinational circuit using ROM. The circuit accepts a 3-bit binary number and generates an output binary number equal to the square of the input number. **(5)**

Q9 **Write short notes on any THREE :** **(5x3)**
a) Mealy – Moore model of finite state machine
b) Ring counter
c) Full adder using half adder
d) PROM