

**3 (Sem-3) ELE M 2**

**2017**

**ELECTRONICS**

**( Major )**

Paper : 3.2

**( Digital System )**

Full Marks : 60

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Choose the correct one from the following :

1×8=8

- (a) A full-adder circuit has
- (i) two inputs and one output
  - (ii) two inputs and two outputs
  - (iii) three inputs and two outputs
  - (iv) three inputs and three outputs
- (b) Which of the following number systems has a base of 16?
- (i) Binary
  - (ii) Decimal
  - (iii) Octal
  - (iv) Hexadecimal

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( Turn Over )

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- (c) In an SR latch built from NOR gates, which of the following conditions is not allowed?
- (i)  $S = 0, R = 0$
  - (ii)  $S = 0, R = 1$
  - (iii)  $S = 1, R = 0$
  - (iv)  $S = 1, R = 1$
- (d) Bubbled OR gate is equivalent to
- (i) OR gate
  - (ii) AND gate
  - (iii) NAND gate
  - (iv) NOR gate
- (e) The binary equivalent of decimal 10 is
- (i) 1100
  - (ii) 1010
  - (iii) 1011
  - (iv) 1101
- (f) BCD equivalent of 57 is
- (i) 111001
  - (ii) 01010111
  - (iii) 101111
  - (iv) None of the above

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- (g) The logical expression  $Y = A + \bar{A}B$  is equivalent to
- (i)  $Y = AB$
  - (ii)  $Y = \bar{A}B$
  - (iii)  $Y = A + \bar{B}$
  - (iv)  $Y = A + B$
- (h) Which of the following circuits is a parallel to serial converter?
- (i) Digital counter
  - (ii) Decoder
  - (iii) Demultiplexer
  - (iv) Multiplexer

2. Answer any six questions from the following :

$2 \times 6 = 12$

- (a) Convert (245.25) decimal number to binary equivalent number.
- (b) What is sequential circuit? How is it different from combinational logic circuits?
- (c) What are different methods used of triggering a digital circuit?
- (d) What do you mean by ROM? How is it different from RAM?
- (e) What do you mean by fan-in and fan-out of digital logic circuits?

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- (f) Design an AND gate using NAND gate only.
- (g) Define the two laws of De Morgan's theorem.

3. Answer any *four* questions from the following : 5×4=20

- (a) Design a half-adder circuit using K-map from its truth table. Convert the half-adder circuit to full-adder circuit.
- (b) Discuss the operation of a *JK* flip-flop with its truth table. What is the advantage of master-slave *JK* flip-flop? Convert a *JK* flip-flop to a D flip-flop.
- (c) Design a mod-6 ripple counter using *JK* flip-flop only. Draw the timing diagram of the designed counter.
- (d) Discuss the working of a two-input NAND gate using RTL logic. Give a comparison between RTL and ECL logic families.
- (e) What is sequential access memory? How is it different from static and dynamic memories? Justify your answer with suitable examples.
- (f) Simplify the following expression using K-map only :
- $F(A, B, C, D) = \Sigma(m)(0, 2, 4, 6, 7, 12, 13, 14), \phi(5, 9)$
- Design the logic circuit using basic logic gates after simplification.

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4. Write short notes on any *two* of the following : 10×2=20

- (a) Basic laws of Boolean algebra
- (b) NAND gate with totempole output using TTL logic family
- (c) Astable and monostable multivibrators using 555 timer
- (d) Binary to Gray and Gray to Binary converters

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