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18CS33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the working principle of opto coupler with neat diagram. **(06 Marks)**

b. Derive an expression for collector current and collector emitter voltage of fixed bias circuit. **(06 Marks)**

c. For the circuit shown in Fig.Q.1(c), draw DC load line, use silicon transistor with B = 50, $V_{BE} = 0.7V$. **(08 Marks)**

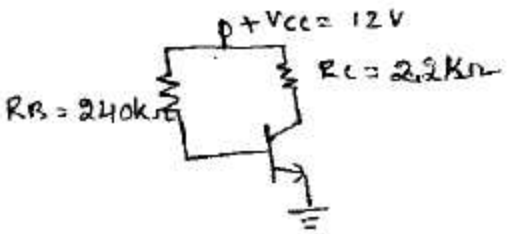

Fig.Q.1(c)

OR

2 a. With the help of neat circuit diagram and wave form explain the working principle of relaxation oscillator. **(10 Marks)**

b. Explain current to voltage converter. **(05 Marks)**

c. Define voltage regulator. Explain adjustable voltage regulator. **(05 Marks)**

Module-2

3 a. Simplify the following function using K-map and obtain simplified Boolean expressions.

i) $f_1(a, b, c, d) = \sum m(1, 3, 4, 5, 7, 10, 12)$

ii) $f_2(a, b, c, d) = \sum m(5, 8, 9, 10, 11, 12, 13, 14, 15)$ **(10 Marks)**

b. Find all the prime implicants of function using Q-M method.

$f(a, b, c, d) = \sum m(0, 2, 3, 4, 8, 10, 12, 13, 14)$ **(10 Marks)**

OR

4 a. For the following function given use Q-M method and obtain simplified expression:

$f(a, b, c, d) = \sum m(7, 9, 12, 13, 14, 15) + dc(4, 11)$ **(08 Marks)**

b. With an example explain Petrik's method. **(06 Marks)**

c. For the given function determine minimal sum using MEV technique. Use d as MEV variable. $f(a, b, c, d) = \sum m(3, 4, 5, 7, 8, 11, 12, 13, 15)$. **(06 Marks)**

Module-3

5 a. Define static 1 – hazard. Explain how static 1-hazard can be detected and removed with an example. **(08 Marks)**

b. What is multiplexer and explain 8 to 1 mux with the help of logic diagram and corresponding expression. **(06 Marks)**

c. Explain the importance of three-state buffer. **(06 Marks)**

OR

6 a. Implement the following functions using 3:8 decoder
$f_1(a, b, c) = \sum m(0, 4, 6, 7)$
$f_2(a, b, c) = \sum m(1, 4, 5)$ **(06 Marks)**

b. Implement the following Boolean functions using an appropriate PLA:
$f_1(a, b, c) = \sum m(0, 4, 7)$
$f_2(a, b, c) = \sum m(4, 6)$ **(06 Marks)**

c. Realize a full adder using PAL. **(08 Marks)**

Module-4

7 a. Explain the structure of VHDL program. Write VHDL code for 4-bit parallel adder using full adder as component. **(08 Marks)**

b. With necessary diagrams, Explain switch debouncing with an S-R latch. **(06 Marks)**

c. Explain D flip-flop with the help of timing diagram. **(06 Marks)**

OR

8 a. Give the implementation of T-flip-flop from D flip-flop. **(04 Marks)**

b. Explain master-slave J-K flip-flop operation. **(08 Marks)**

c. Derive the characteristic equations for the following flip-flops:
i) S-R flip-flop
ii) D-flip flop
iii) T-flip-flop
iv) J-K flip-flop. **(08 Marks)**

Module-5

9 a. With neat sketch, explain the working principle of Serial Input Serial Output (SISO) shift register. **(06 Marks)**

b. Design 3 bit synchronous binary counter using transition table of T-flip-flop **(08 Marks)**

c. Explain how 4 bit register with data, load, clear and clock input is constructed using D-flip-flops. **(06 Marks)**

OR

10 a. With the help of state graph, state and transition table and timing diagram, explain sequential parity checker. **(06 Marks)**

b. With the help of block diagram, explain the working principle of n-bit parallel adder with accumulator. **(08 Marks)**

c. Analyze following Moore sequential circuit for an input sequence X = 01101 and draw the timing diagram. **(06 Marks)**

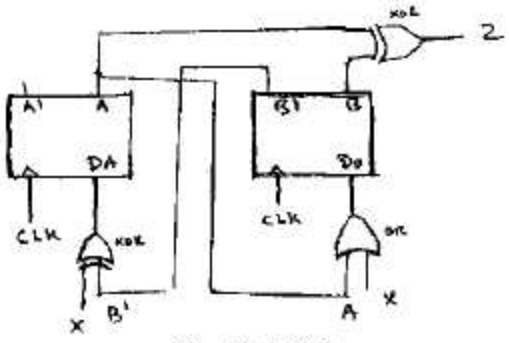

Fig.Q.10(c)

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