

Third Semester B.E. Degree Examination, June/July 2025

Analog and Digital Electronics

Max. Marks: 100

Module-1

- 1 a. Explain the working principle of opto couples 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 the Fig Q1(c). Draw DC load line, use silicon transistor with $\beta = 50$ and $V_{BE} = 0.7V$

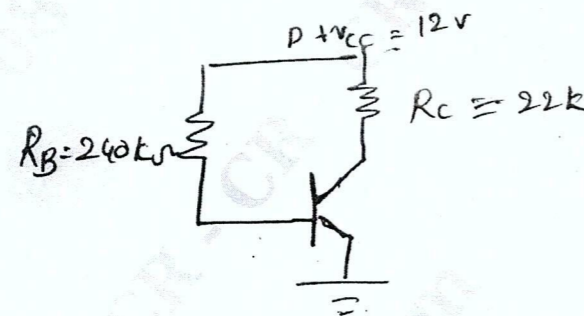


Fig Q1(c)

(08 Marks)

OR

- 2 a. With the help of a 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. Simply the following function using K-map and obtain simplified Boolean expressions. (10 Marks)
 - i) $f_1(a, b, c, d) = \sum m(1, 3, 4, 5, 7, 10, 12)$
 - ii) $f_2(a, b, c, d) = \sum m(5, 8, 9, 10, 11, 12, 13, 14, 15)$
- b. Find all the prime implicants of function using Q-M method. (10 Marks)

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

OR

- 4 a. For the following function use Q-M method and obtain simplified expression. (08 Marks)

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

$$f(a, b, c, d) = \sum m(3, 4, 5, 7, 8, 11, 12, 13, 15).$$

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 3-state Buffer. (06 Marks)

OR

- 6 a. Implement the following functions using 3 : 8 Decodes. (06 Marks)

$$f_1(a, b, c) = \sum m(0, 4, 6, 7)$$

$$f_2(a, b, c) = \sum m(1, 4, 5).$$
- b. Implement the following Boolean function using an appropriate PLA (06 Marks)

$$f_1(a, b, c) = \sum m(0, 4, 7)$$

$$f_2(a, b, c) = \sum m(4, 6,)$$
- 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 SR latch. (06 Marks)
- c. Explain D Flip-Flop with the help of timing diagram. (06 Marks)

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- 8 a. Give the implementation of T-Flip-flop from D-Flip-Flop. (04 Marks)
- b. Explain Master – Slave JK-Flip-Flop operation. (08 Marks)
- c. Derive the characteristics equation of following flip-flops (08 Marks)
 - i) SR Flip-Flop ii) D Flip-Flop iii) T Flip-Flop iv) JK Flip-Flop.

Module-5

- 9 a. With a neat sketch, explain the working principle of Serial In and Serial Out (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 diagram, explain sequential parity checker. (10 Marks)
- b. With the help of neat block diagram, explain the working principle of n-bit parallel adder with accumulator. (10 Marks)

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2 of 2