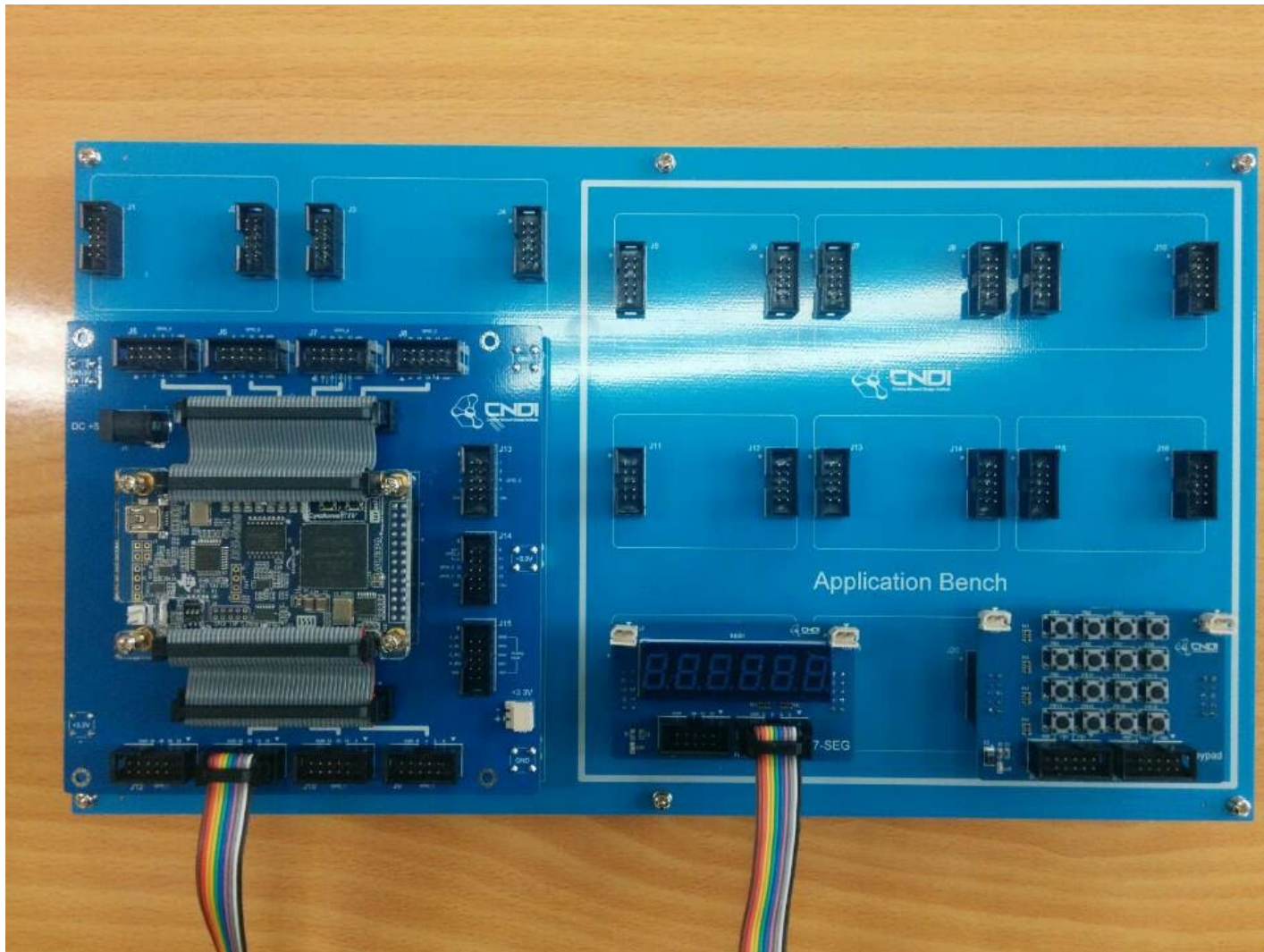# 설계 과제

논리회로실험 2023-2

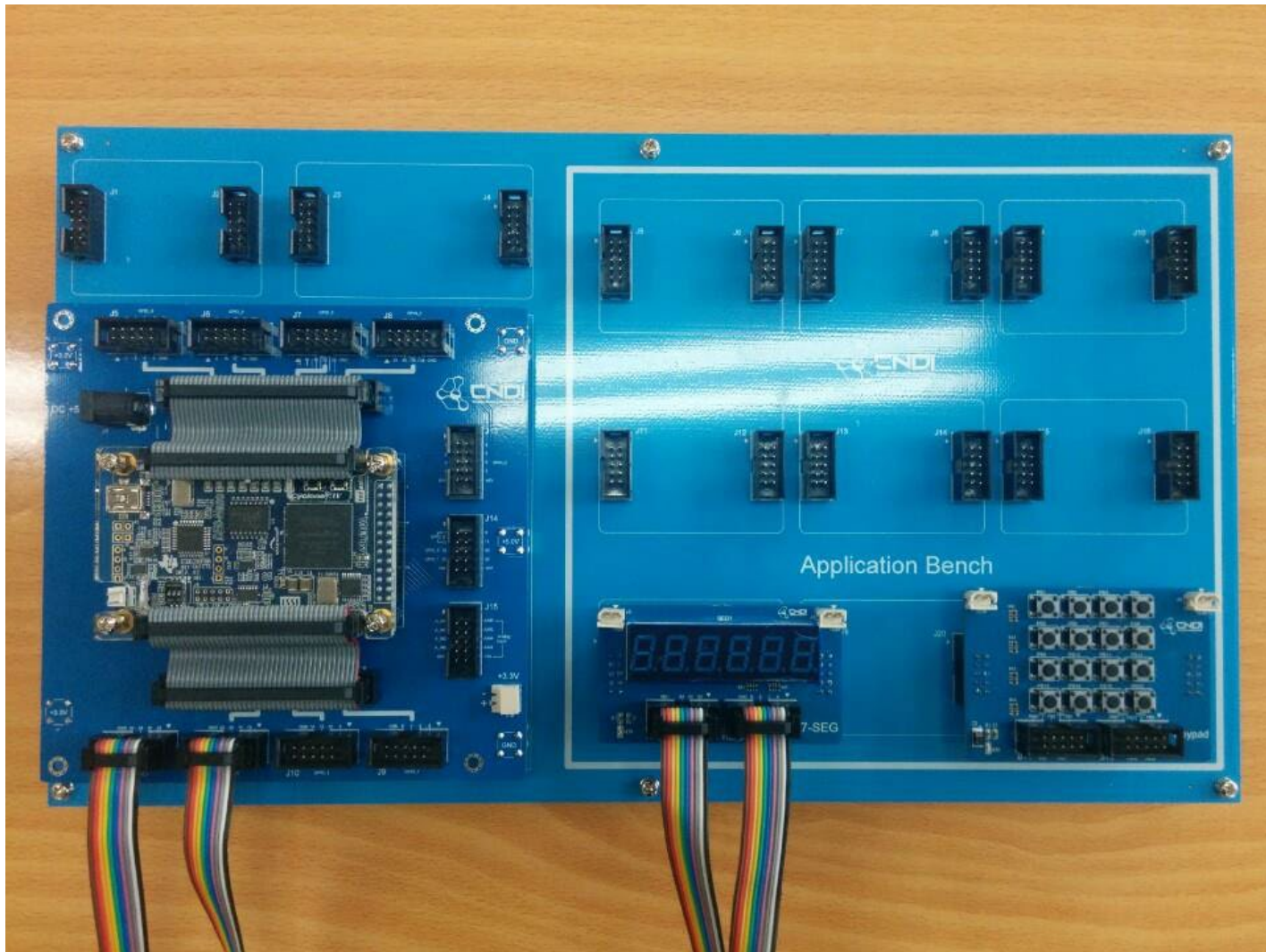# 1. 목표

- FPGA Kit에서 7-segment 모듈과 Keypad 모듈을 이용하여 사칙연산 계산기를 만든다.
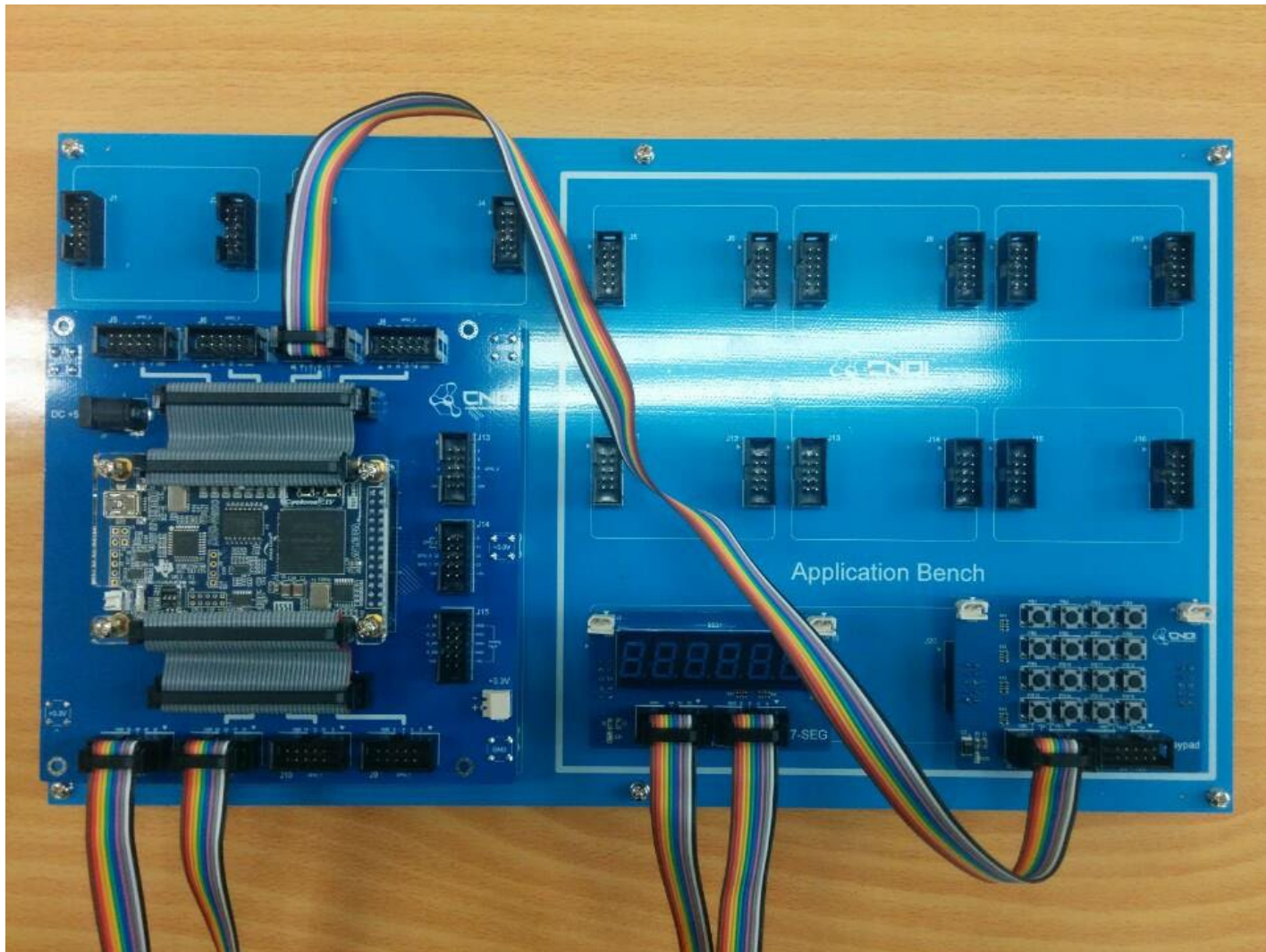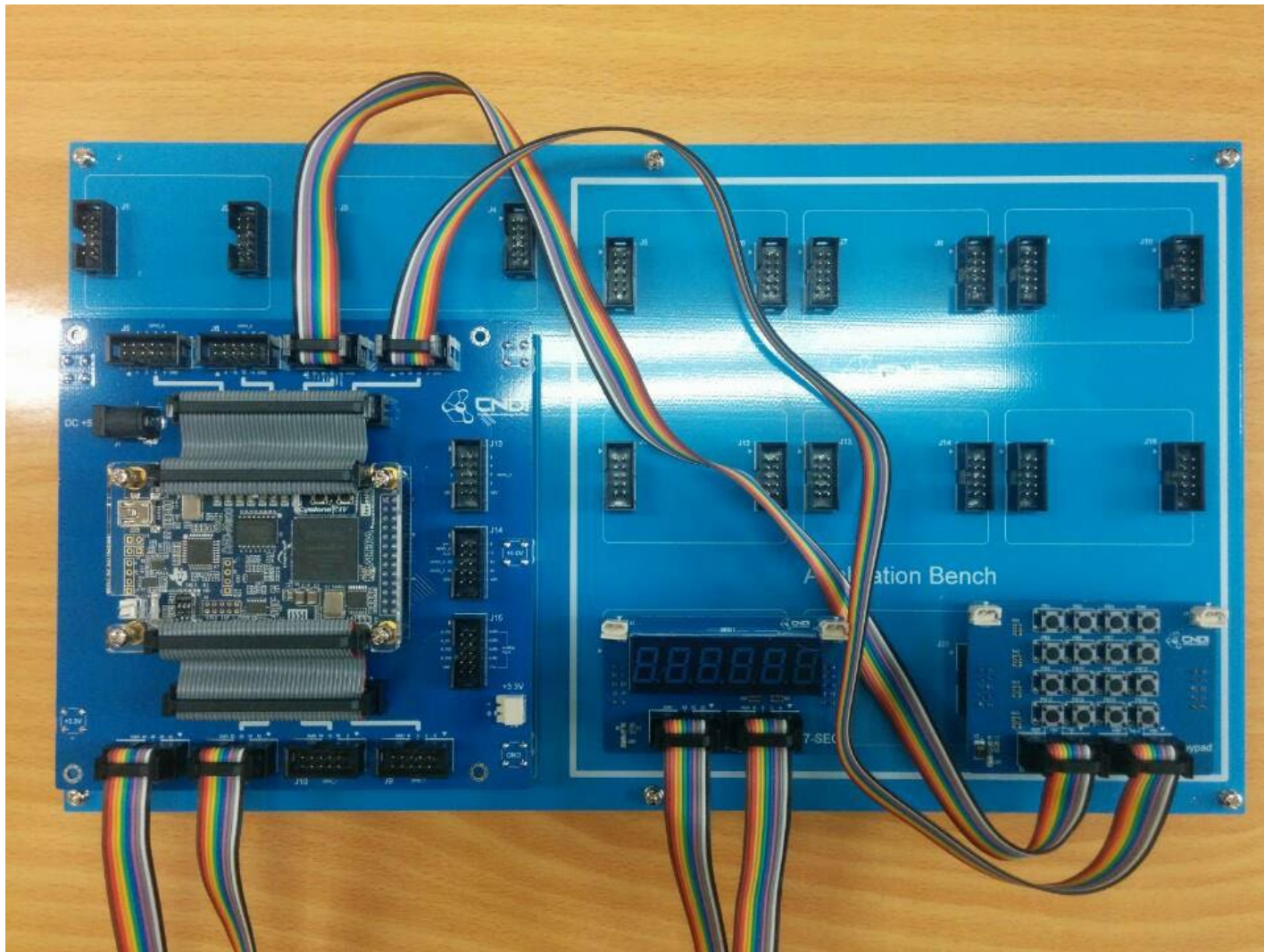
2. Kit 구성

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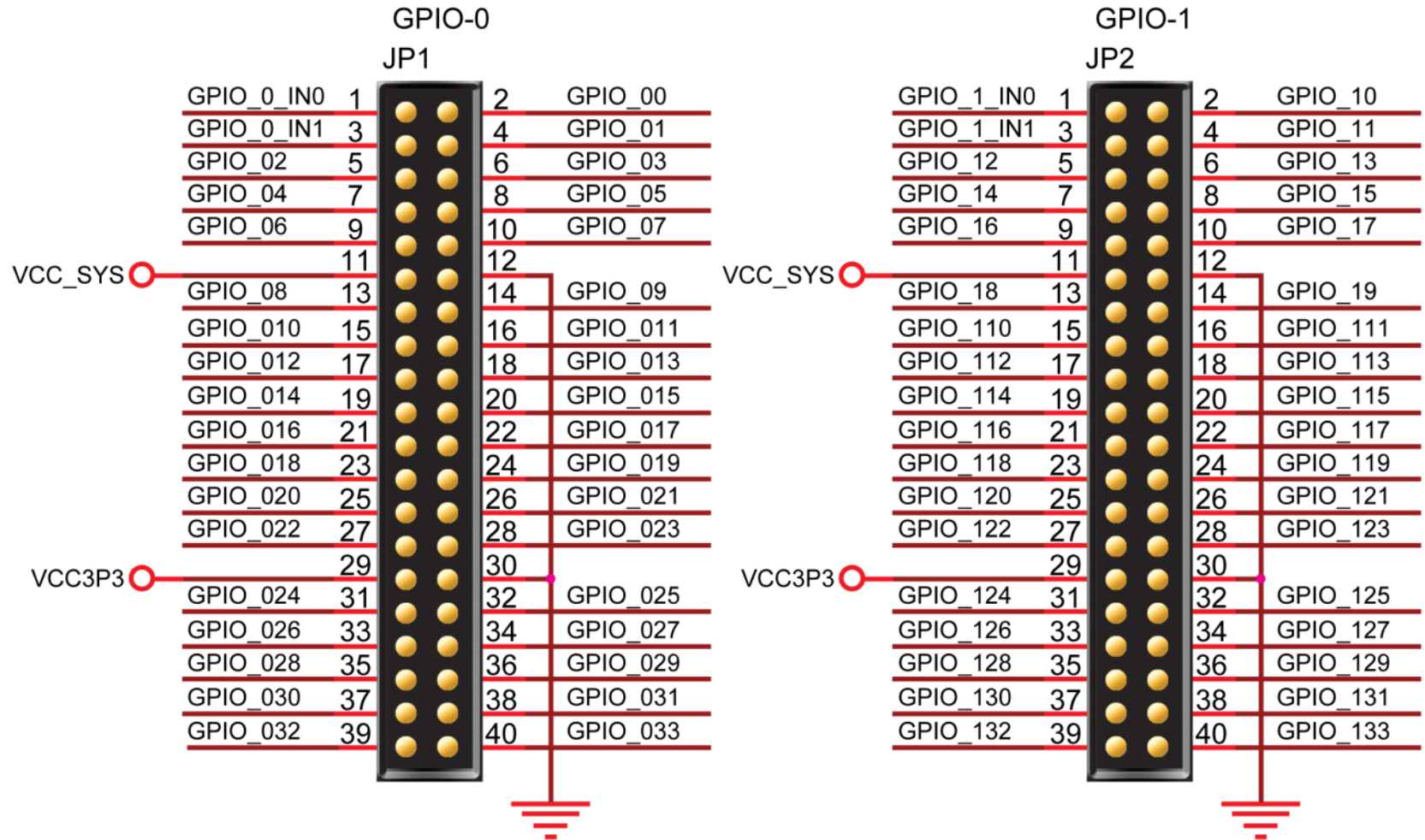
2. Kit 구성

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Table 3-3   GPIO-0 Pin Assignments

Signal Name	FPGA Pin No.	Description	I/O Standard
GPIO_0_IN0	PIN_A8	GPIO Connection DATA	3.3V
GPIO_00	PIN_D3	GPIO Connection DATA	3.3V
GPIO_0_IN1	PIN_B8	GPIO Connection DATA	3.3V
GPIO_01	PIN_C3	GPIO Connection DATA	3.3V
GPIO_02	PIN_A2	GPIO Connection DATA	3.3V
GPIO_03	PIN_A3	GPIO Connection DATA	3.3V
GPIO_04	PIN_B3	GPIO Connection DATA	3.3V
GPIO_05	PIN_B4	GPIO Connection DATA	3.3V
GPIO_06	PIN_A4	GPIO Connection DATA	3.3V
GPIO_07	PIN_B5	GPIO Connection DATA	3.3V
GPIO_08	PIN_A5	GPIO Connection DATA	3.3V
GPIO_09	PIN_D5	GPIO Connection DATA	3.3V
GPIO_010	PIN_B6	GPIO Connection DATA	3.3V
GPIO_011	PIN_A6	GPIO Connection DATA	3.3V
GPIO_012	PIN_B7	GPIO Connection DATA	3.3V
GPIO_013	PIN_D6	GPIO Connection DATA	3.3V
GPIO_014	PIN_A7	GPIO Connection DATA	3.3V
GPIO_015	PIN_C6	GPIO Connection DATA	3.3V
GPIO_016	PIN_C8	GPIO Connection DATA	3.3V
GPIO_017	PIN_E6	GPIO Connection DATA	3.3V
GPIO_018	PIN_E7	GPIO Connection DATA	3.3V
GPIO_019	PIN_D8	GPIO Connection DATA	3.3V
GPIO_020	PIN_E8	GPIO Connection DATA	3.3V
GPIO_021	PIN_F8	GPIO Connection DATA	3.3V
GPIO_022	PIN_F9	GPIO Connection DATA	3.3V
GPIO_023	PIN_E9	GPIO Connection DATA	3.3V
GPIO_024	PIN_C9	GPIO Connection DATA	3.3V
GPIO_025	PIN_D9	GPIO Connection DATA	3.3V
GPIO_026	PIN_E11	GPIO Connection DATA	3.3V
GPIO_027	PIN_E10	GPIO Connection DATA	3.3V
GPIO_028	PIN_C11	GPIO Connection DATA	3.3V
GPIO_029	PIN_B11	GPIO Connection DATA	3.3V
GPIO_030	PIN_A12	GPIO Connection DATA	3.3V
GPIO_031	PIN_D11	GPIO Connection DATA	3.3V
GPIO_032	PIN_D12	GPIO Connection DATA	3.3V
GPIO_033	PIN_B12	GPIO Connection DATA	3.3V

2. Kit 구성

Table 3-4   GPIO-1 Pin Assignments

Signal Name	FPGA Pin No.	Description	I/O Standard
GPIO_1_IN0	PIN_T9	GPIO Connection DATA	3.3V
GPIO_10	PIN_F13	GPIO Connection DATA	3.3V
GPIO_1_IN1	PIN_R9	GPIO Connection DATA	3.3V
GPIO_11	PIN_T15	GPIO Connection DATA	3.3V
GPIO_12	PIN_T14	GPIO Connection DATA	3.3V
GPIO_13	PIN_T13	GPIO Connection DATA	3.3V
GPIO_14	PIN_R13	GPIO Connection DATA	3.3V
GPIO_15	PIN_T12	GPIO Connection DATA	3.3V
GPIO_16	PIN_R12	GPIO Connection DATA	3.3V
GPIO_17	PIN_T11	GPIO Connection DATA	3.3V
GPIO_18	PIN_T10	GPIO Connection DATA	3.3V
GPIO_19	PIN_R11	GPIO Connection DATA	3.3V
GPIO_110	PIN_P11	GPIO Connection DATA	3.3V
GPIO_111	PIN_R10	GPIO Connection DATA	3.3V
GPIO_112	PIN_N12	GPIO Connection DATA	3.3V
GPIO_113	PIN_P9	GPIO Connection DATA	3.3V
GPIO_114	PIN_N9	GPIO Connection DATA	3.3V
GPIO_115	PIN_N11	GPIO Connection DATA	3.3V
GPIO_116	PIN_L16	GPIO Connection DATA	3.3V
GPIO_117	PIN_K16	GPIO Connection DATA	3.3V
GPIO_118	PIN_R16	GPIO Connection DATA	3.3V
GPIO_119	PIN_L15	GPIO Connection DATA	3.3V
GPIO_120	PIN_P15	GPIO Connection DATA	3.3V
GPIO_121	PIN_P16	GPIO Connection DATA	3.3V
GPIO_122	PIN_R14	GPIO Connection DATA	3.3V
GPIO_123	PIN_N16	GPIO Connection DATA	3.3V
GPIO_124	PIN_N15	GPIO Connection DATA	3.3V
GPIO_125	PIN_P14	GPIO Connection DATA	3.3V
GPIO_126	PIN_L14	GPIO Connection DATA	3.3V
GPIO_127	PIN_N14	GPIO Connection DATA	3.3V
GPIO_128	PIN_M10	GPIO Connection DATA	3.3V
GPIO_129	PIN_L13	GPIO Connection DATA	3.3V
GPIO_130	PIN_J16	GPIO Connection DATA	3.3V
GPIO_131	PIN_K15	GPIO Connection DATA	3.3V
GPIO_132	PIN_J13	GPIO Connection DATA	3.3V
GPIO_133	PIN_J14	GPIO Connection DATA	3.3V

3. 설계 과제 (60%)

- 6자리 숫자를 사칙 연산할 수 있는 계산기 설계
- 입력된 숫자는 7 segment 모듈에 표시
- 필수 구현
  - 숫자와 연산기호를 번갈아 가며 입력 후 '='를 입력하여 연산 마무리
    (숫자: 0~999999, 연산기호: +, -, *, /(몫), %(나머지))

    ex)
    113 + 24 − 36875 + 421124 − 509 = 383877
    1 + 2 = 3
    1 − 2 = -1
  - 연산자 우선순위 무시 (1 + 2 * 3 − 2 = 7)
  - 초기화 버튼 구현
  - 추가 기능 구현 – 2가지 (자유롭게)
- 예외처리 구현
  - 0으로 나누었을 때 Error 출력
  - Overflow(999999 초과) 시 Error 출력
- 최종 결과물은 Verilog로 구현

4. 설계 계획서 (20%)

- 설계 목표
- 과제 요구사항에 대한 분석 및 해결 방안
- 설계 과정에서 예상되는 문제점 및 해결 방안
- 프로젝트 동작 블록 다이어그램
- 조원 역할 분담 (어떤 역할을 맡아서 진행할 것인지 작성)

5. 설계 보고서 (20%)

- Verilog 프로젝트 압축하여 첨부
- 설계 목표 및 요구사항
- 요구사항 달성 정도
- 상세한 설계 내용 (기능별 상세한 설명)
- 기능별 결과사진
- 개인별 기여도 평가(기능별) 및 고찰