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| **Question** | **Q2** |  | **Name** |  |
| **Your score** |  |  | **Student ID** |  |
| **Full score** | **20** |  |  |  |

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| EE3046 Microcomputers Theory and Laboratory, 2022 Spring Semester  **Final Exam (8051)** *Scope*: CPU design*Time*: 18:00~20:50 |

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Best viewing mode for this question sheet | |  |  | | --- | --- | | English version: | 中文版 | |  |  | |      |  |  | | --- | --- | | Input files | 9876543210陳小美Q2.circ  myLib  2022Spring-FinalExam – Q2.docx  Note: 9876543210 陳小美 Q2.circ contains the same circuit as 9876543210 陳小美 Q1.circ does. | | Answer upload | Upload your answering file「9876543210陳小美Q2.circ」  (Note: Change “9876543210陳小美” to your own student ID and real name before uploading your file.) | |

Q2. (20%) Circuit modification to adopt a new instruction 『**JZR Rn,offset**』

**New instruction description：**

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| Instruction format | JZR Rn,offset |
| Machine code | 11001nnn offset |
| Function | If Acc = 0, jump to 「**Rn** + **offset**」.  If Acc ≠ 0, don’t jump. |
| Example | Let R2 = 20H.  If Acc = 0,  『JZR R2,6H』 will cause the program execution to jump to 0020H + 0006H = 0026H;  『JZR R2,0F3H』 will cause the program execution to jump to 0020H + FFF3H = 0013H.  If Acc ≠ 0, the program execution does not jump. |
| Note | The destination address is 16-bit, but **Rn** and **offset** are both 8-bit.  Before adding, **Rn** must be extended to 16 bits by adding 8 leading “0”s  , and **offset** must be sign-extended to 16 bits. |

**Circuit modification：**

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| Please modify the circuit **9876543210 陳小美 Q2.circ** so that the CPU circuit will be able to execute the 『**JZR**  **Rn,offset**』instruction.  提醒: Please highlight your modification with “highlight – big”, “highlight – medium”, or “highlight – small”, which can be found in myLib-01. |

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| After finishing, please upload the circuit **9876543210 陳小美 Q2.circ**.  Please remember to change the filename with your own student ID number and your real name before uploading. |

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