International Islamic University Islamabad Faculty of Engineering and Technology

Department of Electrical and Computer Engineering Computer Architecture and Organization Lab (CO 202 L)

Lab 12: Using Subroutines

|  |  |
| --- | --- |
| **Name:** | **Shujat\_Ali\_Shah** |
| **Reg. No:** | **90-FET/BSCE/F23** |
| **Date of Experiment:** | **13/05/025** |

OBE Rubrics Evaluation

**a) PSYCHOMOTOR (To be judged in the field/lab during experiment)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr.**  **No.** | **Criteria** | **Level 1**  (0%) | **Level 2**  (25%) | **Level 3**  (50%) | **Level 4**  (75%) | **Level 5**  (100%) | **Marks**  **Obtained** |
| **1** | **Practical Implementation** | **0** | **1.25** | **2.5** | **3.75** | **5** |  |
| Absent | With several critical errors and  incomplete | With few errors, and incomplete | With some errors and complete | Without errors and complete |
| **2** | **Use of Equipment or Simulation/**  **Programming Tool** | **0** | **0.5** | **1** | **1.5** | **2** |  |
| Absent | Limited competence | Some competence | Considerable competence | Competence |

1. **COGNITIVE (To be judged on the copy of experiment submitted)**

|  |  |  |  |  |  |  |  |
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| **Sr.**  **No.** | **Criteria** | **Level 1**  (0%) | **Level 2**  (25%) | **Level 3**  (50%) | **Level 4**  (75%) | **Level 5**  (100%) | **Marks**  **Obtained** |
| **3** | **Level of Participation & Attitude to Achieve Individual/Group**  **Goals** | **0** | **0.25** | **0.5** | **0.75** | **1** |  |
| Absent | Bad Attitude | Decent Attitude | Good Attitude | Proactive Attitude |

1. **AFFECTIVE (To be judged in the field/lab during experiment)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr.**  **No.** | **Criteria** | **Level 1**  (0%) | **Level 2**  (25%) | **Level 3**  (50%) | **Level 4**  (75%) | **Level 5**  (100%) | **Marks**  **Obtained** |
| **4** | **Level of Participation & Attitude to Achieve Individual/Group**  **Goals** | **0** | **0.5** | **1** | **1.5** | **2** |  |
| Absent | Rare sensible interaction | Some sensible interaction | Good sensible interaction | Encouraging sensible interaction |  |

|  |  |  |
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| **5** | **TOTAL OBTAINED MARKS (Out of 10)** |  |

|  |  |  |
| --- | --- | --- |
|  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ORG  LDA | 100  X | /  / | Main program  Load X |
| BSA | SH4 | / | Branch to subroutine |
| STA | X | / | Store shifted number |
| LDA | Y | / | Load Y |
| BSA | SH4 | / | Branch to subroutine again |
| STA | Y | / | Store shifted number |
| HLT |  | / | halt |
| X, | HEX | 1234 | / | shift left this number |
| Y, | HEX | 4321 | / | shift left this number too |

Program 12.1: Using Subroutine

/ This is the Subroutine to shift left a number 4 times

SH4, HEX

CIL CIL CIL CIL AND

BUN

0

MSK

SH4

/ Store return address here

/ Circulate left 1st time

/ Circulate left 2nd time

/ Circulate left 3rd time

/ Circulate left 4th time

/ Set AC(0-4) to zero

I / Return to main program

MSK, HEX FFF0 / Mask operand

END / End of Program

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ORG  LDA | 200  X | /  / | Main program  Load X |
| BSA | OR | / | Branch to subroutine OR |
| HEX | 3AF6 | / | Second Operand Stored Here |
| STA | Y | / | Subroutine returns here |
| HLT |  | / | halt computer |
| X, | HEX | 7B95 | / | First operand stored here |
| Y, | HEX | 0 | / | Result is stored here |
| OR, | HEX | 0 | / | Subroutine OR |
|  | CMA |  | / | Complement first operand |
|  | STA | TMP | / | Store in temporary location |
|  | LDA | OR I | / | Load second operand |
|  | CMA |  | / | Complement second operand |
|  | AND | TMP | / | AND complemented first operand |
|  | CMA |  | / | Complement again to get OR |
|  | ISZ | OR | / | Increment return address |
|  | BUN | OR I | / | Return to main program |
| TMP, | HEX | 0 | / | Temporary Storage |
|  | END |  |  |  |

Program 12.2: Passing Parameters to a Subroutine

**Lab 12 Task:** Write a subroutine to perform bitwise XOR of two 16-bit numbers

Solution:







