**Registers:**

|  |  |
| --- | --- |
| Register Name | Usage |
| $0 | Contains Constant Value of 0 |
| $1 | Temporaries |
| $2 | Temporaries |
| $3 | Temporaries |
| $4 | Temporaries |
| $5 | Temporaries |
| $6 | Temporaries |
| $7 | Temporaries |
| $8 | Temporaries |
| $9 | Temporaries |
| $10 | Temporaries |
| $11 | Temporaries |
| $12 | Temporaries |
| $13 | Temporaries |
| $14 | Temporaries |
| $15 | PC (Program Counter) |

**Instructions:**

a) Arithmetic Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Sub | 0 | Opcode (0001) | Immediate  (Don’t care) | Dest | rss | rtt |
| Add | 0 | Opcode  (0000) | Immediate  (Don’t care) | Dest | rss | rtt |
| Add immediate | 0 | Opcode  (0011) | Immediate  (Don’t care) | Dest | rss | rtt  (Don’t care) |
| Multiply | 0 | Opcode  (0010) | Immediate  (Don’t care) | Dest | rss | rtt |

b) Logical Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Or | 0 | Opcode (0100) | Immediate  (Don’t care) | Dest | rss | rtt |
| And immediate | 0 | Opcode  (0101) | Immediate | Dest | rss | rtt  (Don’t care) |
| Shift right logical | 0 | Opcode  (0110) | Immediate | Dest | rss | rtt  (Don’t care) |
| Shift left logical | 0 | Opcode  (0111) | Immediate | Dest | rss | rtt  (Don’t care) |

c) Data Transfer Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Lw | 0 | Opcode (1000) | Immediate | Dest | rss | rtt  (Don’t care) |
| sw | 0 | Opcode  (1001) | Immediate | Dest  (Don’t care) | rss | rtt |

d) Conditional Branch Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Branch on equal | 0 | Opcode (1010) | Immediate | Dest  (Don’t care) | rss | rtt |
| Branch on less than | 0 | Opcode  (1011) | Immediate | Dest  (Don’t care) | rss | rtt |

e) Comparison Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Set on less than immediate | 0 | Opcode (1100) | Immediate | Dest | rss | rtt  (Don’t care) |

f) Unconditional Jump Instructions:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 bit | 4 bits | 15 bits | 4 bits | 4 bits | 4 bits |
| Jump Register | 0 | Opcode (1101) | Immediate  (Don’t care) | Dest  (Don’t care) | rss | rtt  (Don’t care) |