

- (b) (i) Translate the following C Code to MIPS Assembly Code. Use a minimum number of instructions. Assume that i, j, k and f correspond to registers \$s3, \$s4, \$s5 and \$s6. (8)

```
switch(k)
{
    case 1: f = i + j; break;
    case 2: f = i - j; break;
    case 3: f = i * j; break;
    case 4: f = i / j; break;
    default: f=0; break;
}
```

- (ii) Will overflow condition occurs for addition and subtraction in MIPS architecture? Justify your answer (8)

10. (a) Solve $(-0.75_{10}$ and $0.4375_{10})$ in binary with necessary algorithm and flow chart. (16)

(OR)

- (b) Tabulate the steps to divide 00001010 by 0010 in binary with necessary algorithm and flow chart. (16)

11. (a) Solve 15×8 with refined version of the algorithm and flow chart. (16)

(OR)

- (b) The following sequence of instructions are executed in the basic 5-stage pipelined processor: (16)

or r1,r2,r3

or r2,r1,r4

or r1,r1,r2

a. Indicate dependencies and types.

b. Assume there is no forwarding in this pipelined processor. Indicate hazards and add NOP instructions to eliminate them.

c. Assume there is full forwarding. Indicate hazards and add NOP instructions to eliminate them.

12. (a) (i) Assume a computer has on-chip and off-chip caches, main memory and virtual memory. Assume the following hit rates and access times: on-chip cache 95%, 1 ns, off-chip cache 99%, 10 ns, main memory: X%, 50 ns, virtual memory: 100%, 2,500,000 ns. Notice that the on-chip access time is 1 ns. We do not want our effective access time to increase much beyond 1 ns. Assume that an acceptable effective access time is 1.6 ns. What should X be (the percentage of page faults) to ensure that EAT is no worse than 1.6 ns? (8)

- (ii) Assume a computer has 32 bit addresses. Each block stores 16 words. A direct-mapped cache has 256 blocks. In which block (line) of the cache would we look for each of the following addresses? Addresses are given in hexadecimal for convenience. a. 1A2BC012 b. FFFF00FF c. 12345678 d. C109D532 (8)

(OR)

- (b) (i) Compare and contrast the different types of multithreading. (10)
- (ii) Are programmed I/Os associated with computers? Justify. (6)