Solutions to Exercises in Chapter 7

1. How many levels of parallelism can be specified using OpenACC?

   Answer: Three for each parallel region: gangs, worker, vectors. Additional levels of parallelism can be exploited via nested parallelism (a parallel region inside an existing one), however this is currently not supported on the current compiler implementations.

2. Which of the following following directives is the most performance portable?

   a. #pragma acc parallel loop

   b. #pragma acc parallel loop gang

   c. #pragma acc parallel loop vector

   d. #pragma acc parallel loop vector vector_length(N)

   Answer: “A”

3. Which of the following memories models does OpenACC support? Describe any limitations that apply to those models that are supported.

   a. Shared Memory

   b. Discrete Memories

   c. Partially Shared Memory

   Answer: As of OpenMP 2.5 is a) and b). In the future OpenACC plans to support c). Shared memory models we have to deal with data races. Discrete memories, we have to create two copies and synchronize them (one on the host another on the device), possibly affecting performance.

4. Which of the following clauses can be used to tune for a specific architecture?

   a. Specifying a vector_length()

   b. Specifying number of gangs, workers, vectors

c. acc copyin/copyout

d. All of the above

e. None of the above

Answer: A and B

5. Is an OpenACC compiler allowed to:

   a. Ignore directives specified by the user

   b. Change values in directives provided by the user

   c. Both

   d. Neither

   Answer: a and b. A compiler implementing OpenACC may choose to ignore the information provided by the user.