



I SEMESTER M.TECH (COMPUTER SCIENCE AND ENGINEERING)
MAKEUP EXAMINATIONS, DECEMBER 2017
HIGH PERFORMANCE COMPUTING SYSTEMS [CSE 5104]
REVISED CREDIT SYSTEM
Date: 28-12-2017

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ❖ Answer **ALL** the questions.
- ❖ Missing data, if any, may be suitably assumed.

- 1A.** With the block diagram of MISD computer organization explain its functionalities. Discuss the three types of concurrency that can be identified in parallel processing systems. **4M**
- 1B.** What is the difference between the arithmetic pipeline and instruction pipeline? Draw a reservation table for each of them considering instruction pipeline and arithmetic pipeline as linear and nonlinear respectively. **4M**
- 1C.** Draw and explain a block diagram of Asynchronous linear pipeline **2M**
- 2A.** Design a barrel shifting network for $N = 8$ nodes where N is the number of nodes in the network. In your design analyze all the possible data routing permutation cycles. **4M**
- 2B.** Design 8×8 baseline multistage network. Explain your design methodology. **3M**
- 2C.** With neat diagram, discuss crossbar switch network system for multiprocessors. **3M**
- 3A.** Applying a convolution filter to a source image, discuss the sequential code for convolution algorithm. Write the convolution kernel in OpenCL for the same. **5M**
- 3B.** Write a parallel algorithm to sum n values using 4D hypercube SIMD model where n is the number of values to be added and p is the number of processors in the model. It is assumed that the each processor initially holds one of the values among n . **3M**
- 3C.** For question 3B, assume 4D hypercube SIMD model with $n = p = 16$. Show how such addition happens using appropriate diagrams with suitable example. **2M**
- 4A.** Write an algorithm to sort N numbers using odd-even transposition sorting. Discuss the different phases involved in an iteration. **4M**
- 4B.** Discuss on the dependence information between the instructions in the instruction stream of superscalar execution and VLIW execution. **3M**
- 4C.** Write all the OpenCL API calls with their arguments up to the command queue creation. **3M**
- 5A.** How can you find out the execution time taken by kernel function in OpenCL? Specify all the statements required for this. **4M**
- 5B.** Write a parallel program in CUDA to add two matrices. **4M**
- 5C.** How do you compute the threadID in the kernel with 1D grid of 1D block and 1D grid of 2D blocks. **2M**