Indian Institute of Technology Tirupati
Computer System Architecture (CS5202)
Class Test 1

Date: 31st Jan, 2019

Registration No.:

Name:

[Max marks: 20][Time: 40 min]

1. Plot (rough sketch) a trend graph on performance change of processors in terms of clock frequency since 1978 to 2012. Indicate at least four example processors (with different clock frequency) from different period of time since 1978.   [2 *mark*] [4 *min*]

2. Given the data in the Table 1 answer the following questions:

   (a) Calculate the arithmetic mean of execution time of all the three processors

   (b) Calculate the geometric mean of the ratios and comment on the role of reference computer the Sun Ultra in comparing the performance of AMD and Intel.

   [5 *mark*] [10 *min*]

3. Let assume that you have performed a set of experiments and made a measurements of the following parameters as follow:

Frequency of FP instructions	=	25%
Avg CPI of FP instructions	=	4.0
Avg CPI of other instructions	=	1.33
Frequency of FPSQR	=	2%
CPI of FPSQR	=	20

   Assume that the two design alternatives are to decrease the CPI of FPSQR to 2 or to decrease the Avg CPI of all FP instructions to 2.5. Compare these two design alternatives using the processor performance equation. (Hints: One of the good ways to compare any two designs is by finding out the speedup!)   [5 *mark*] [10 *min*]

benchmark	Sun Altra 2time (second)	AMD A10-6800K time (second)	SPEC 2006Cint ratio	Intel Xeon E5-2690 time (second)	SPEC 2006Cint ratio	AMD/Intel times	intel/AMD SPEC ratios
perlbench	9770	401	24.36	261	37.43	1.54	1.54
bzip2	9650	505	19.11	422	22.87	1.20	1.20
gcc	8050	490	16.43	227	35.46	2.16	2.16
mef	9120	249	36.63	153	59.61	1.63	1.63
gobmk	10490	418	25.10	382	27.46	1.09	1.09
hmmer	9330	182	51.26	120	77.75	1.52	1.52
sjeng	12100	517	23.40	383	31.59	1.35	1.35
libquntum	20720	84	246.08	3	7295.77	29.65	29.65

Table 1: SPEC2006Cint execution time of AMD and Intel processor and a reference Sun Ultra5 processor

4. Generally processors are classified based on the internal storage that is used to read the operand from and write the results into the storage. Name the four different type of architectures which are classified as in the text book. Draw a block diagram with basic components of any of the architecture of your choice. [2 *mark*] [4 *min*]

5. Name five most frequently used (as per the experiment on SPEC2000 for Tex, gcc, and spice) addressing mode and explain those by taking one example from any of RISC instructions and one from x86 (any instruction from 80386 onwards). [2 *mark*] [4 *min*]

6. Consider the following C code which defines a structure as below:

```
struct csaiittp {
        char section ;
        bool yesno ;
        int  count ;
        double regno ;
        short  code ;
        float  score1 ;
        double score2 ;
        char *name ;
        float *all ;
        int roud;
} ;
```

For a 32-bit machine, what is the size of the foo struct? What is the minimum size required for this struct to store it in the memory, assuming you may arrange the struct member as you wish? Assume the memory is byte addressable. [4 *mark*] [8 *min*]