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**Seventh Semester B.E. Degree Examination, June/July 2018**

**Embedded Computing Systems**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Define design methodology. Explain embedded system design process. (12 Marks)  
b. List and explain the challenges of embedded computing system design. (08 Marks)
  
- 2 a. What is cache? How it relates to memory system mechanism? Explain different types of cache. (08 Marks)  
b. Solve the following:  
i) What is the average memory access time of machine whose hit rate 93% with cache access time of 5 ns and main memory access time of 80 ns?  
ii) Calculate cache hit rate, if the cache access time is 5 ns, average memory access time is 6.5 ns and main memory access time is 80 ns. (05 Marks)  
c. What is an interrupt? Explain with neat diagram the interrupt mechanism. (07 Marks)
  
- 3 a. Assume that the bus has 1 MHz bus clock period, width is 2 bytes per transfer, data transfer itself takes 1 clock cycles, address and handshaking signals before data is 2 clock cycles and sending ACK after data is 1 clock cycles:  
i) What is the total transfer time in clock to transfer of total 612000 bytes of data?  
ii) What is the total burst mode transfer time in clock cycle, if B = 2 byte with 2 byte wide?  
iii) Calculate the total real time to transfer data. (08 Marks)  
b. What is bus? Write the major components of bus protocol. Explain burst read transaction with timing diagram. (08 Marks)  
c. Explain components of embedded programs. (04 Marks)
  
- 4 a. Sketch and explain data flow and control data flow (CDFG) graph for programming model. (10 Marks)  
b. Consider the following 'C' code statement  
if (a + b > 0)  
    X = 5;  
else  
    X = 7;  
i) Write CDFG for above C statement.  
ii) Generate the ARM Assembly code for the above C statement. (06 Marks)  
c. Explain briefly types of performance measures on programs. (04 Marks)

**PART – B**

- 5 a. Define process. With neat diagrams, explain memory organization and state transition of a process. (10 Marks)  
b. What is multitasking? Explain the types of multitasking. (04 Marks)  
c. Distinguish between process and thread. (06 Marks)

- 6 a. Define IPC. Explain the IPC mechanism adopted by different operating systems. (10 Marks)  
b. Explain system architecture of telephone answering machine. (05 Marks)  
c. Write digital telephone answering machine requirement form. (05 Marks)
- 7 a. Explain Hardware and Software Architectures of distributed system. (06 Marks)  
b. Explain multihop communication with a neat diagram. (05 Marks)  
c. Explain IP packet structure and internet service stack with neat diagram. (09 Marks)
- 8 a. Explain various hardware debugging tools used in embedded product development. (08 Marks)  
b. Explain Monitor program based firmware debugging and In Circuit Emulator (ICE) based firmware debugging. (12 Marks)

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