

--	--	--	--	--	--	--	--	--	--

**Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014**  
**Embedded Computing System**

Time: 3 hrs.

Max. Marks: 100

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

**PART – A**

1.
  - a. What is an embedded system? Explain the purpose of ES? List its major application areas and give one example for each? (08 Marks)
  - b. Differentiate the following, with an example :
    - i) Microprocessor and microcontroller
    - ii) Embedded system and general purpose computers. (06 Marks)
  - c. Write a requirement chart for digital camera? (03 Marks)
  - d. List challenges of embedded computing system design? Explain briefly any two challenges. (03 Marks)
  
2.
  - a. What are the major difference between Von neuman and Hardward architecture? (04 Marks)
  - b. Explain the following :
    - i) Restrictions of MUL instruction
    - ii) Uses of MLA instruction
    - iii) Register indirect addressing in ARM
    - iv) Write a ARM assembly code for below C – statement  $z = (x | 22)$  and  $(y >> 2)$
    - v) Disadvantages of busy – wait IO? (07 Marks)
  - c. What is an interrupt? Explain with neat diagram the interrupt mechanism. (05 Marks)
  - d. Solve the following :
    - i) What is the average memory access time of machine whose hit rate is 93% with cache access time of 5ns and mainmemory 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? (04 Marks)
  
3.
  - a. Explain with neat diagram, the bus with a DMA controller. (05 Marks)
  - b. Explain the following briefly :
    - i) Counter
    - ii) Watchdog timer
    - iii) Break point
    - iv) Timer. (04 Marks)
  - c. Differentiate PCI and USB by their characteristics. (03 Marks)
  - d. Assume that the bus has a 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 cycles to transfers 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)

- 4 a. Consider the following ARM assembly code, which illustrate some sample C statement.

LDR	LDR	ADD	STR	LDR	LDR	ADD	STR	LDR	ADD	STR	LDR	LDR	SUB	STR
r <sub>0</sub> , a	r <sub>1</sub> , b	r <sub>2</sub> , r <sub>0</sub> , r <sub>1</sub>	r <sub>2</sub> , w	r <sub>0</sub> , c	r <sub>1</sub> , d	r <sub>2</sub> , r <sub>0</sub> , r <sub>1</sub>	r <sub>2</sub> , x	r <sub>1</sub> , e	r <sub>0</sub> , r <sub>1</sub> , r <sub>2</sub>	r <sub>0</sub> , u	r <sub>0</sub> , a	r <sub>1</sub> , b	r <sub>2</sub> , r <sub>1</sub> , r <sub>0</sub>	r <sub>2</sub> , z

Answer total following :

- Write the sample C code fragment for the above ARM assembly code
  - Draw a lifetime graph that shows uses of register in register allocation for the above C statement
  - Modify the obtained C code statement using operator scheduling for register allocation
  - Draw a lifetime graph for the modified 'C' code appear
  - Write a ARM assembly code for the modified 'C' code using register allocation. (10 Marks)
- b. Consider the following 'C' code statement
- ```

if (a > b)
    x = a + b ;
else
    x = a - b ;

```
- Write CFG for the above 'C' statement
  - Generate the ARM assembly code for the above 'C' statement. (07 Marks)
- c. Explain briefly different types of performance measures on programs. (03 Marks)

### PART – B

- What is RTOS? Explain with an example the hard real time and soft real time. (06 Marks)
  - Differentiate process and threads. What are the parameters of PCB of a process? Why should each process have a distinct PCB? (08 Marks)
  - What is the significance of spinlock? (02 Marks)
  - What is semaphores? Explain briefly the different types of semaphores? (04 Marks)
- Explain with neat diagram, the concept of memory mapped object. (08 Marks)
  - Explain the following :
    - Message passing
    - Remote procedure call for IPC. (06 Marks)
  - What are the factors needs to be evaluated in selection of an RTOS? Explain. (06 Marks)
- Explain with neat diagram the various fields of IP packet. (08 Marks)
  - List the features of internet LAN. (04 Marks)
  - With neat diagram, explain the various fields of CAN frame. (06 Marks)
  - Briefly explain any two features of HTTP protocols. (02 Marks)
- Explain the following :
    - Simulator
    - Target system
    - Debugging
    - Logic analyzer. (08 Marks)
  - Explain features advantages and limitations of simulator based debugging. (06 Marks)
  - Explain the types of multitasking. (06 Marks)

\* \* \* \* \*