

B.E., DEGREE EXAMINATIONS: MAY/JUNE 2013

Eighth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE147: Embedded Systems

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Car engine control system is a
 - a) hard real-time systems
 - b) soft real-time systems
 - c) firm real-time systems
 - d) Networked embedded systems
2. Video games is an example of
 - a) virtual machine platform
 - b) cross platform
 - c) Java platform
 - d) native platform
3. The standard bus used in the distributed network of industrial plant controllers is
 - a) USB
 - b) I²C
 - c) CAN
 - d) FireWire
4. Which of the following is an asynchronous mode communication standard
 - a) HDLC
 - b) SPI
 - c) Bluetooth
 - d) RS232C
5. The ROM memory address of the PIC with 16KB on-chip code ROM is
 - a) 00000 – 00FFF
 - b) 00000 – 03FFF
 - c) 00000 – 07FFF
 - d) 00000 – 0FFFF
6. Which of the following architecture is used in PIC ?
 - a) Harvard
 - b) Von Neumann
 - c) Harvard and Von Neumann
 - d) Modified Von Neumann
7. Embedded real-time operating system implements
 - a) Round-robin algorithm
 - b) Round-robin with priority algorithm
 - c) Preemptive multitasking
 - d) Non-preemptive multitasking
8. Which of the following is not a mechanism for achieving Mutex?
 - a) Disabling the scheduler
 - b) Disabling the tasks
 - c) Semaphores
 - d) Disabling the interrupts

9. The OS used in navigation system in an aircraft is
- | | |
|-----------------|------------|
| a) QNX Neutrino | b) VxWorks |
| c) MicroC/OS-II | d) RTLinux |
10. The operating system used in DVD player is
- | | |
|-------------------|-----------------|
| a) Symbian OS | b) MicroC/OS-II |
| c) Windows CE.NET | d) Palm OS |

PART B (10 x 2 = 20 Marks)

11. List few of the important tools required for embedded software development/testing.
12. What is the purpose of DMA?
13. How are serial and parallel ports of I/O devices classified.
14. A device port may have multibyte data input buffer(s) and data output buffers. What are the advantages of these?
15. What is context switching?
16. What are the objects of an operating system kernel?
17. What is meant by 8-level program counter stack?
18. How many times the following loop will be executed? Count is a general purpose register.
- ```

loop: movlw 0x05
 movwf count
 decfsz count, 1
 goto loop
 end

```
19. Create four blocks of memory with each block of 1KB using MicroC/OS-II. Consider the data type MEMTYPE, a 16-bit unsigned number, to define the number of bytes and blocks which can be between 0 and 65535. Let the starting address of the memory be 0x8000 and the maximum number of bytes at a block is 65535.
20. How are source files classified in MicroC/OS-II?

**PART C (5 x 14 = 70 Marks)**

21. a) (i) What are the special requirements of embedded operating systems? Discuss the architecture of Embedded OS that meets these requirements. (10)
- (ii) Compare the types of architectures available for the processors. (4)
- (OR)**
- b) (i) What are the advantages of communication interfaces in embedded systems? Explain the protocol suite required to network –enable an embedded system. (10)
- (ii) Differentiate CISC and RISC processors. (4)

22. a) (i) A new generation automobile has about 100 embedded systems. How do the bus arbitration bits, control bits for address and data length, data bits, CRC check bits, acknowledge bits and ending bits in CAN bus help the networking of devices distributed in automobile system. (10)

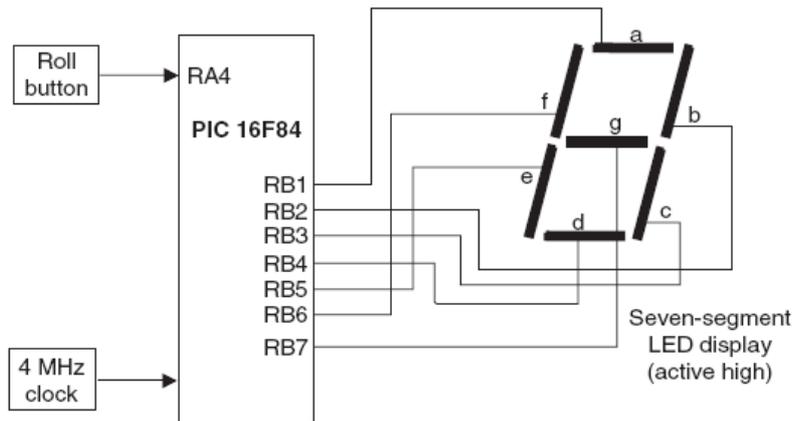
(ii) What is FireWire bus standard? (4)

(OR)

b) (i) A mobile smart phone has T9 keypad. With neat sketch explain the states of each key. Also give the new states generated by a combination of two keys. (9)

(ii) List few sophisticated interfacing features in device ports. (5)

23. a) Write an PIC assembly language program to generate a random number at the display between 1 and 6, when the input button is pressed. The display should be retained when the button is released.



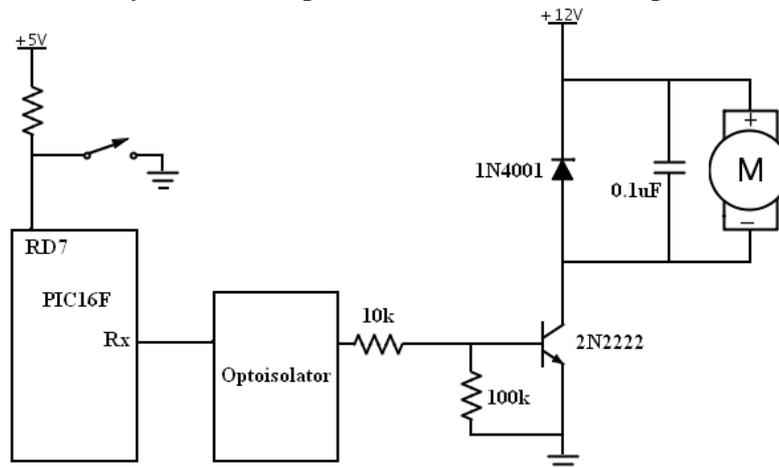
(OR)

b) In the figure shown below, write a PIC program to monitor the status of the switch and perform the following:

a) if PORTD.7 = 1, the dc motor moves with 25% duty cycle pulse

b) if PORTD.7 = 0, the dc motor moves with 50% duty cycle pulse

Assume Rx to be any convenient pin in PIC. State the assumptions.



24. a) (i) Explain how a semaphore can be used for inter-task synchronization. (9)  
(ii) “In any real-time system with rate monotonic priority assignment, all deadlines are guaranteed to be met.” Is the statement True or False. State your reason. (5)

(OR)

- b) (i) Is Priority inheritance an important feature? Discuss (8)  
(ii) Consider the following C code segment. (6)

```
/* Counter Implementation */
static int counter = 0;
int incrementCounter()
{
 return ++ counter;
}
```

Is the function reentrant or non-reentrant? Discuss the issues associated with the execution of the above program.

25. a) Discuss the steps involved in designing a digital camera. Also describe its hardware and software architecture.

(OR)

- b) Discuss the requirements and functioning of a smart card communication system. Give its architecture and synchronization model.

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