EE458 - Embedded Systems
Introduction to uC/OS Cont.

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A uC/OS queue is a fixed-size FIFO. Only ______ quantities may be stored in the queue. In addition to allocating a uC/OS queue data structure, you must also allocate the memory that is used to hold the messages:

```c
#define QSIZE 10
OS_Q qds;  // Queue data structure
void *QStorage[QSIZE]; // Queue storage
```
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uC/OS Queues

- Before using the queue you must initialize it:

  ```
  status = OSQInit(&qds, &QStorage[0], QSIZE);
  ```

- Use **OSQPost()** to post (32 bit) messages to the queue. This function will not block. It will return an error if the queue is ______:

  ```
  status = OSQPost(&qds, (void *) msg);
  ```
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uC/OS Queues

- **OSQPEnd()** is used to retrieve the first value from the queue. This function will block if the queue is empty:

  ```c
  BYTE error;
  char *msg = (char *)OSQPend(&qds, timeout, &error);
  ```

- **error** is a return argument and should be checked to see if an error occurred. If **timeout** is 0, the function will wait __________.
A FIFO can be used to be pass data structures from one task to another. The data structure must have a _______ pointer as its first element:

```c
struct {
    void *ptr;
    char str[20]; } MyStruct;

OS_FIFO myfifo;
status = OSFifoInit((OS_FIFO *) &MyStruct);
```
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uC/OS FIFOs

- **OSFifoPost()** is used to post data structures to the FIFO:

```c
MyStruct mydata;
strcpy(mydata.str, "Hello world");
status = OSFifoPost
    (&myfifo, (OS_FIFO_EL *)&mydata);
```

- **OSFifoPostFirst()** can be used to post a structure at the _______ of the FIFO:

```c
status = OSFifoPostFirst
    (&myfifo, (OS_FIFO_EL *)&mydata);
```
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uC/OS FIFOs

- **OSFifoPend()** is used to retrieve a data structure from a FIFO. It returns a **________** to the posted data structure:

```c
MyStruct *str_ptr;
str_ptr = (MyStruct *) OSFifoPend(&myfifo, timeout);
```

- This function will block until there is data in the FIFO or the **timeout** value is reached. If **timeout** is 0 the function will block forever.
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uC/OS Queues vs FIFOs

• uC/OS Queues and FIFOs have some similarities, but also some fundamental differences. __________ should definitely be used when passing 32-bit data items (samples from an A/D converter).

• Either can be used to “pass” larger data structures. (Pass pointers to the data structures when using a queue.) Queues are of fixed size while FIFOs are of arbitrary size (a linked-list underlies a FIFO).
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uC/OS Queues vs FIFOs

• Normally messages are added to the end of a queue or a FIFO, but it is possible to add a message to the front of a FIFO.

• Note that the message is not ________ when working with a FIFO. You must ensure that access to the underlying data by the sending and receiving tasks is synchronized. (This same problem exists when using a queue to pass pointers to data structures.)
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uC/OS Flags

- uC/OS flags are similar to RTEMS. A flags object must be initialized before using any of the related functions:

  ```c
  OS_FLAGS myflag;
  OSFlagCreate(&myflag);
  ```

- Bits are set using `OSFlagSet()`:

  ```c
  // Set bits 7 and 31
  OSFlagSet(&myflag, 0x80000080);
  ```
You can either wait on all bits in a given mask to be set or on ____ of them:

// Wait until all of bits 0-3 and 12-15 are set
status = OSFlagPendAll
(&myflag, 0x0000F00F, timeout);

// Wait until any odd bit is set
status = OSFlagPendAny
(&myflag, 0xAAAAAAAAAA, timeout);
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uC/OS Flags

- **OSFlagClear()** is used to clear flags in a flag object:

  ```c
  // Clear all flags
  OSFlagClear(&myflag, 0xFFFFFFFF);
  ```

- Finally, **OSFlagState()** returns the current flag ________:

  ```c
  DWORD cur_flg = OSFlagState(&myflag);
  ```