**Chapter 13 – Embedded Operating Systems**

**TRUE/FALSE QUESTIONS:**

T F 1)  Linux is a multiuser OS based on UNIX.

T F 2)  Typically, more complex embedded systems do not include an OS.

T F 3)  An antilock braking system in a car is an example of an embedded system.

T F 4)  General-purpose computer systems far outnumber embedded systems.

T F 5)  A simple embedded system, with simple functionality, may be controlled

by a special-purpose program or set of programs with no other software.

T F 6)  Embedded software does not execute in response to external events.

T F 7)  General-purpose operating systems typically permit any user process to

use interrupts directly.

T F 8)  The disadvantage of using a general-purpose OS is that it is not optimized

for real-time and embedded applications.

T F 9)  Android is an embedded OS based on a Linux kernel.

T F 10)  ”Has a slow and lightweight process or thread switch” is a typical characteristic

of a specialized embedded OS.

T F 11)  The TinyOS system provides a more streamlined approach for an embedded

OS than one based on a commercial general-purpose OS.

T F 12)  To deal with timing constraints the kernel maintains a real-time clock.

T F 13)  A key differentiator between desktop/server and embedded Linux distributions

is that desktop and server software is typically compiled on one platform but is

intended to be executed on another.

T F 14)  The TinyOS scheduler operates across all components.

T F 15)  μClinux is a popular open-source Linux kernel variation targeted at microcontrollers

and other very small embedded systems.

**MULTIPLE CHOICE QUESTIONS:**

1)  \_\_\_\_\_\_\_\_\_\_ refers to the use of electronics and software within a product.

A)  TinyOS   B)  General purpose computer

C)  Embedded system   D)  Desktop system

2)  \_\_\_\_\_\_\_\_\_ was developed primarily for use with networks of small wireless sensors.

A)  API   B)  TinyOS

C)  eCos   D)  MQS

3)  The well-known \_\_\_\_\_\_\_\_ law continues to drive down the size of memory and processing logic elements.

A) Dzack’s    B) Babbage’s

C) Hopper’s    D) Moore’s

4)  Configurability, direct use of interrupts, I/O device flexibility, and real-time operation

are some of the unique characteristics and design requirements for \_\_\_\_\_\_\_\_\_\_ .

A)  Tiny OS   B)  eCos

C)  embedded operating systems   D)  OS service routines

5)  Two examples of operating systems that have been designed from the ground up for

embedded applications are TinyOS and \_\_\_\_\_\_\_\_\_ .

A)  eCos   B)  Linux

C)  BSD   D)  HAL

6)  \_\_\_\_\_\_\_\_\_\_ are defined by the processor’s ability to execute complex operating systems, such as

Linux, Android, and Chrome.

A) Microprocessors     B) Dedicated processors

C) Embedded processors     D)  Application processors

7)  \_\_\_\_\_\_\_ is a compressed, read-only file system that was designed for use on low memory or

limited storage size environments such as embedded Linux systems

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A) cramfs     B) ubifs

C) yaffs2     D)  squashfs

8)  \_\_\_\_\_\_\_\_\_ in TinyOS may be tied either directly or indirectly to hardware events.

A)  Commands   B)  Tasks

C)  Timers   D)  Events

9)  \_\_\_\_\_\_\_\_\_ is an advantage of using Linux as the basis for an embedded OS.

A)  Vendor independence   B)  Varied hardware support

C)  Low cost   D)  All of the above

10)  \_\_\_\_\_\_\_\_\_\_ is a C system library originally developed to support μClinux and it is generally

used in conjunction with μClinux.

A) TinyOS     B) Arbiter

C)  μClibc   D) Ubifs

11)  \_\_\_\_\_\_\_\_\_\_ has become a popular approach to implementing wireless sensor

network software.

A)  eCos   B)  TinyOS

C)  Arbiter   D)  Embedded system

12)  Each \_\_\_\_\_\_\_\_\_ in a component is similar to a thread in an ordinary OS, with certain limitations.

A)  kernel   B)  command

C)  event   D)  task

13)  The \_\_\_\_\_\_\_\_\_\_ interface allows the client to hold on to a resource until the client is

notified that someone else needs the resource.

A)  Resource configure   B)  Resource requested

C)  Resource   D)  Resource-specific

14)  Once a client has access to a resource, it uses \_\_\_\_\_\_\_\_\_\_\_ to exchange data and

control information with the resource.

A)  resource-specific interfaces B)  eCos

C)  open sources D)  resource requests

15)  Operate with limited resources, adapt to hardware evolution, support a wide range of

applications, support a diverse set of platforms, and be robust are goals for \_\_\_\_\_\_\_\_\_\_ .

A)  TinyOs   B)  eCos

C)  DSRs   D)  ISRs

**SHORT ANSWER QUESTIONS:**

1. An \_\_\_\_\_\_\_\_\_\_ is any device that includes a computer chip, but that is not a general-purpose computer,

such as a laptop or desktop system

2)  The \_\_\_\_\_\_\_\_\_ provides a more streamlined approach for an embedded OS than one based

on a commercial general-purpose OS, such as an embedded version of Linux.

3)  An embedded software system built using TinyOS consists of a set of small modules,

called \_\_\_\_\_\_\_\_\_ , each of which performs a simple task or set of tasks and which interface

with each other and with hardware in limited and well-defined ways.

4)  The default scheduler in TinyOS is a simple \_\_\_\_\_\_\_\_\_\_ queue.

5)  In TinyOS, \_\_\_\_\_\_\_\_\_\_ are nonblocking requests.

6) The \_\_\_\_\_\_\_\_\_ accepts requests for access and configuration from a client and enforces the

lock on the underlying resource.

7) The \_\_\_\_\_\_\_\_ component mediates data exchange between the client and the underlying resource.

8) Real-time operation, reactive operation, configurability, I/O device flexibility, and streamlined

protection mechanisms are characteristics and design requirements for \_\_\_\_\_\_\_\_\_\_ systems.

9) An existing commercial OS can be used for an embedded system by adding \_\_\_\_\_\_\_\_ capability,

streamlining operation, and adding necessary functionality.

10) \_\_\_\_\_\_\_\_ is when the platform provider is not dependent on a particular vendor to provide needed

features and meet deadlines for deployment.

11) The \_\_\_\_\_\_\_\_\_ is a simple, read-only file system that is designed to minimize size by

maximizing the efficient use of underlying storage.

12) Three abstractions for resources are used in TinyOS: dedicated, virtualized, and \_\_\_\_\_\_\_\_ .

13) Interrupts and counters are examples of \_\_\_\_\_\_\_\_ abstractions.

14) A clock or timer is an example of the \_\_\_\_\_\_\_\_\_ abstraction.

15) The shared resource configuration provides the following interfaces to a client: Resource,

Resource requested, \_\_\_\_\_\_\_\_ , and resource-specific interfaces.