I Mid-Term Examination – BCA II Semester
Session 2011-2012 (Even semester)
Subject: Operating System(BCA123)
SOLUTION

Section – A

Attempt all the questions (0.5X 16 = 08)

1. Choose the right option for following questions

(i) Round robin scheduling is essentially the preemptive version of
Ans (a) FIFO
(ii)) In the blocked state
Ans (a) the processes waiting for I/O are found
(iii) The process related to process control, file management, device management, information about system and communication that is requested by any higher level language can be performed by
Ans (c) System Call
(iv) Which is not the state of the process ?
Ans (d) Privileged
(v) The number of processes completed per unit time is known as
Ans (b) Throughput
(vi) The state of a process after it encounters an I/O instruction is
Ans (b) Blocked/Waiting
(vii) Which technique was introduced because a single job could not keep both the CPU and the I/O devices busy?
Ans (d) Multiprogramming .
(viii) FIFO scheduling is _____.
Ans (b) Non Preemptive Scheduling
(ix) Switching the CPU to another Process requires to save state of the old process and loading new process state is called as
Ans (b) Context Switch
(x) CPU Scheduling is the basis of _____ operating system
Ans (c) Multiprogramming
(xi) A major problem with priority scheduling is _____.
Ans (b) Starvation.
(xii) Multiprocessing _____.
Ans (b) Allows multiple processes to run simultaneously
(xiii) The technique, for sharing the time of a computer among several jobs, which switches jobs so rapidly such that each job appears to have the computer to itself, is called _____.
Ans (a) Time Sharing
(xiv) The operating system manages _____.
Ans (d) All of the above
(xv) Super computers typically employ _____.
Ans (b) Multiprocessors OS
(xvi) Which of the following is contained in Process Control Block (PCB)?
Ans (d) All of the Above

Section – B

Attempt any two questions. (2 X 2 =04)

1. Write a short note on

a) Buffering

Ans **Buffering**

A **buffer** is a memory area that stores data while they are transferred between two devices or between a device and an application. Buffering is done for three reasons.

One reason is to cope with a speed mismatch between the producer and consumer of a data stream. Suppose, for example, that a file is being received via modem for storage on the hard disk. The modem is about a thousand times slower than the hard disk. So a buffer is created in main memory to accumulate the bytes received from the modem. When an entire buffer of data has arrived, the buffer can be written to disk in a single operation.

A **second** use of buffering is to adapt between devices that have different data-transfer sizes. Such disparities are especially common in computer networking, where buffers are used widely for fragmentation and reassembly of messages. At the sending side, a large message is fragmented into small network packets. The packets are sent over the network, and the receiving side places them in a reassembly buffer to form an image of the source data.

A **third** use of buffering is to support copy semantics for application I/O. Suppose that an application has a buffer of data that it wishes to write to disk. It calls the write () system call, providing a pointer to the buffer and an integer specifying the number of bytes to write.

b) SPOOLING

Ans **Spooling (Simultaneous Peripheral Operation On-Line)**

A spool is a buffer that holds output for a device, such as a printer, that cannot accept interleaved data streams. Although a printer can serve only one job at a time, several applications may wish to print their output concurrently, without having their output mixed together. The operating system solves this problem by intercepting all output to the printer. Each application's output is spooled to a separate disk file. When an application finishes printing, the spooling system queues the corresponding spool file for output to the printer. The spooling system copies the queued spool files to the printer one at a time.
Spooling is also used for processing data at remote sites. The CPU sends the data via communication paths to a remote printer (or accepts an entire input job from a remote card reader). The remote processing is done at its own speed, with no CPU intervention. The CPU just needs to be notified when the processing is completed, so that it can spool the next batch of data.

2. Write a short note on

a) Device driver

Ans Each I/O device attached to a computer needs some device specific code for controlling it. This code is called the device drive.The device driver is generally written by the device's manufacturer and delivered along with the device on CD-ROM. Since each OS needs its own drivers and device manufacturers.
Each device driver normally handles one device type or one class of closely related device.
Eg. If the system supports different brands of mouse then only a single mouse driver is used. Or a disk driver can handle multiple disks of different size and different speeds. But since, mouse and disk are different devices, so their drivers are also different.

b)Device controller.

AnsA general-purpose computer system consists of CPUs and multiple device controllers that are connected through a common bus. Each device controller is in charge of a specific type of device. Depending on the controller, there may be more than one attached device. For instance, seven or more devices can be attached to the **small computer-systems interface (SCSI)** controller. A device controller maintains some local buffer storage and a set of special-purpose registers.

i) Command Register

ii) Status Register

iii) Data Register

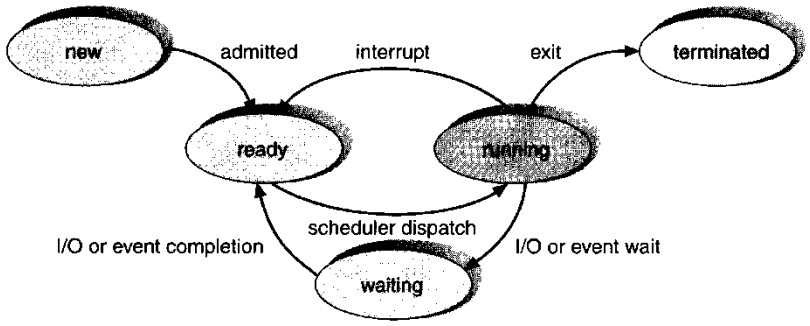
The device controller is responsible for moving the data between the peripheral devices that it controls and its local buffer storage. Typically, operating systems have a **device driver** for each device controller. This device driver understands the device controller and presents a uniform interface to the device to the rest of the operating system.

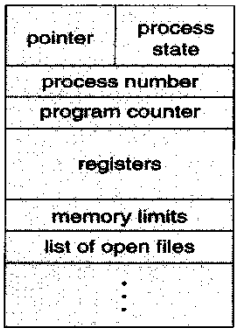
3. **Explain all the process states with diagram? Also explain PCB?**

Ans Process State

As a process executes, it changes **state.** The state of a process is defined in part by the current activity of that process. Each process may be in one of the following states:

- **New.** The process is being created.
- **Running.** Instructions are being executed.
- **Waiting.** The process is waiting for some event to occur (such as an I/O completion or reception of a signal).
- **Ready.** The process is waiting to be assigned to a processor.
- **Terminated.** The process has finished execution.





Each process is represented in the operating system by a **process control block (PCB)** also called a *task control block.* A PCB contains many pieces of information associated with a specific process, including these:
• **Process state.** The state may be new, ready, running, waiting, halted, and so on.
• **Program counter.** The counter indicates the address of the next instruction to be executed for this process.
• **CPU registers.** The registers vary in number and type, depending on the computer architecture. They include accumulators, index registers, stack pointers, and general-purpose registers, plus any condition-code information. Along with the program counter, this state information must be saved when an interrupt occurs, to allow the process to be continued correctly afterward.
• **CPU-scheduling information.** This information includes a process priority, pointers to scheduling queues, and any other scheduling parameters.
• **Memory-management information.** This information may include such information as the value of the base and limit registers, the page tables, or the segment tables, depending on the memory system used by the operating system.
• **Accounting information.** This information includes the amount of CPU and real time used, time limits, account members, job or process numbers, and so on.
• **I/O status information.** This information includes the list of I/O devices allocated to the process, a list of open files, and so on.
In brief, the PCB simply serves as the repository for any information that may vary from process to process.

Section – C

Attempt any two questions (2 X 4 =08)

Q1.What is operating system? Explain the functions of operating system ?

Ans An **Operating system** is a program that manages the computer hardware. It also provides a basis for application programs and acts as an intermediary between the computer user and the computer hardware. It is an system software. The purpose of operating system is to provide an environment in which user can execute its programs. The main objective of an operating system is to make computer system convenient to use and utilize computer hardware in an efficient manner.

Functions/Components of Operating System:

Operating System is a large collection of software which manages the resources of computer system like memory, processor, file system etc. So various functions/components of OS are:

1 Process management

A program in its execution state is known as **process.** A process needs certain resources including CPU time, memory, files and I/O devices to accomplish its task. These resources are either given to the process when it is created or allocated to it while it is running.

The operating system is responsible for the following activities in process management:
• Creating and deleting both user and system processes
• Suspending and resuming processes
• Providing mechanisms for process synchronization
• Providing mechanisms for process communication
• Providing mechanisms for deadlock handling.

2 Memory management

Main memory is a large array of words or bytes having its own address. Main memory is a collection of quickly accessible data shared by the CPU and I/O devices.

The operating system is responsible for the following activities in memory management:
• Keeping track of which parts of memory are currently being used and by whom
• Deciding which processes and data to move into and out of memory
• Allocating and deallocating memory space as needed.

3 File-System Management

Files represent programs and data. Data files may be numeric, alphabetic, alphanumeric, or binary form which are stored on different type of storage media such as tapes and disks.

The operating system is responsible for the following activities with file management:

• Creating and deleting files
• Creating and deleting directories to organize files
• Supporting primitives for manipulating files and directories
• Mapping files onto secondary storage
• Backing up files on stable (nonvolatile) storage media.

4 Secondary storage Management

Since main memory is too small to accommodate all data and programs, and the data that it holds are lost when power is lost, the computer system must provide secondary storage to back up main memory.

The operating system is responsible for the following activities with disk management:

• Free-space management
• Storage allocation
• Disk scheduling

5 **I/O system Management**

One of the purposes of an operating system is to hide the complixites of specific hardware devices from the user.

The operating system is responsible for the following activities with I/O subsystem:

• A memory-management component that includes buffering, caching, and spooling
• A general device-driver interface
• Drivers for specific hardware devices.

6 Protection and Security

If a computer system has multiple users and allows the concurrent execution of multiple processes, then access to data must be regulated. For that purpose, mechanisms ensure that files, memory segments, CPU, and other resources can be operated on by only those processes that have been allowed proper authorization from the operating system. Protection is a mechanism for controlling the access of processes or users to the resources defined by a computer system.

Protection and security require the system to be able to distinguish among all its users. Most operating systems maintain a list of user names and associated **user identifiers (user IDs)**

7 Networking

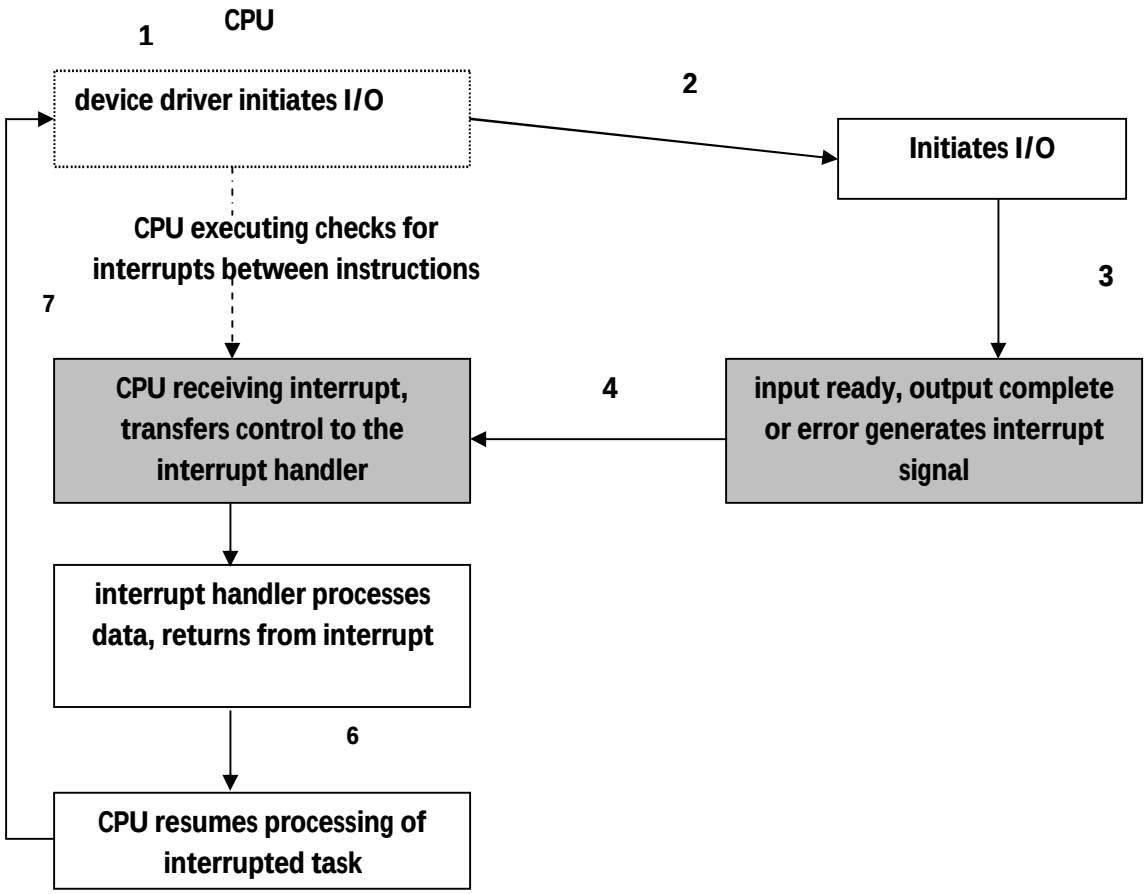
A distributed system is a collection of physically separated computer systems that are networked to provide the users with access to the various resources that the system maintains. Access to a shared resource increases computation speed, functionality, data availability, and reliability.

Network Operating System (NOS) provides remote access to the users. It also provides the sharing of h/w and s/w resources from remote machine to own systems.

Q2.What are interrupts? Explain the interrupts I/O cycle with the help of block diagram?

Ans An interrupt is a signal from a device attached to a computer or from a program within the computer that causes the main program that operates the computer to stop and figure out what to do next. The occurrence of an event is usually signaled by an **interrupt** from either the hardware or the software. Hardware may trigger an interrupt at any time by sending a signal to the CPU, usually through system bus. Software may trigger an interrupt by executing a special operation called a **system call or monitor call**

The basic **interrupt mechanism** works as follows.



Q3 Suppose that the following processes arrive for execution at times indicated and their priorities are given. Each process will run the listed amount of time. Find the average waiting time and turnaround time by priority scheduling.

Ans Process	B.T	Priority	A.T	W.T	T.A.T
P1	7	3	0	9	16
P2	3	1	1	0	3
P3	1	3	3	1	2
P4	2	4	2	14	16
P5	5	2	5	0	5

Gantt chart:

P1	P2	P3	P5	P1	P4

0 1 4 5 10 16 18

Avg. waiting time=(9+0+1+14+0)/5=4.8

Avg. turnaround time=(16+3+2+16+5)/5=8.4