Put a circle around the symbol of the best answer for each of the following questions.

The dynamically allocated objects are stored in

a) Stack
b) Heap
c) Text section
d) Data section

When a process makes an I/O operation during execution its state changes from

a) Ready to waiting
b) Running to ready
c) Running to waiting
d) Running to terminated

Which of the following is not contained (saved) in a PCB?

A) Program counter
B) CPU registers
C) A list of open files
D) Non of the above

The scheduler that selects the process that should be executed next is called

A) Short-term scheduler
B) Long-term scheduler
C) Medium-term scheduler
D) Any of the above can do that

A CPU-bound process spends most of its time

A) either executing or in the ready queue
B) waiting in some I/O device queue
C) waiting for some interrupt to occur
D) waiting for some resource to be available

A Zombie process is

A) a process whose parent terminated without invoking wait().
B) A process that executes concurrently with its parent process
C) A process that shares the same resources with its parent.
D) a process that terminates but its parent has not invoked wait() is called

The context-switch time is:

A) dependent on the underlying hardware support
B) The size and complexity of the PCB

C) The size of the ready queue
D) A and B only

Which of the following statements is true?

A) In single core processors, shared memory is typically faster than message passing
B) Message passing is most useful for exchanging large amounts of data.
C) Share memory is more suitable for distributed systems
D) All of the above

Rendezvous synchronization occurs when

a) The sender uses blocking send and the receiver, uses a non-blocking receive.
b) The sender uses a blocking send and the receiver uses a blocking receive.
c) If both send and receive are non-blocking
d) None of the above

Q

A) In designing an operating system, the separation of policy and mechanism is an important principle. Explain why.

it allows maximum flexibility if policy decisions are to be changed later

B) List two advantages for using a microkernel Operating system structure

Any two of these

- Easier to extend a microkernel (All new services are added to user space and consequently do not require modification of the kernel)
- Easier to port the operating system to new architectures (a few modifications)
- More reliable (less code is running in kernel mode)
- More secure

Q

a) Explain why we cannot store global variables in the stack of a process.

Because we need to be able to access, them from any method/procedure and storing them in the stack would make them available to one method not to all methods

b) Explain why a long-term scheduler needs to select a good mix of I/O-bound and CPU-bound processes?

To make best use of the system resources. If all process are CPU bound then the I/O devices would stay idle. Similarly, if all processes are I/O bound processes, the CPU would be idle most of the time.

Q) Consider the following Java program for socket communication

```
import java.net.*;
import java.io.*;

public class DateServer
{
   public static void main(String[] args) {
      try {
1)       ServerSocket sock = new ServerSocket(6013);

         /* now listen for connections */
         while (true) {
2)          Socket client = sock.accept();

3)          PrintWriter pout = new
             PrintWriter(client.getOutputStream(), true);

            /* write the Date to the socket */
            pout.println("Hello User ");

            /* close the socket and resume */
            /* listening for connections */
            client.close();
         }
      }
      catch (IOException ioe) {
         System.err.println(ioe);
      }
   }
}
```

a) What is the port number used by the program?

Answer: 6013

b) Explain the purpose of the statement labeled as 2 in the program

Answer: Makes the server listen to client requests. When a request is received, it is accepted and the next instruction is executed.

c) When does statement 3 execute?

Answer: Only when a client makes a request.

d) What would a client receive as a result of using (communicating with) this server?

Answer: Hello user

Q) A summing that we use a circular array of size n to implement a bounded buffer with two variables in and out. Where in points to the next available position and out points to the first full position.

`a) Write the code for the producer.

b) Write the code for the consumer