

PART-A

1 a) What are the benefits of Multithreading?

Or

1 b) List out the benefits of multithreading.

Answer:

- Multithreading increases the responsiveness of system as, if one thread of the application is not responding, the other would respond in that sense the user would not have to sit idle.
- Multithreading allows resource sharing as threads belonging to the same process can share code and data of the process and it allows a process to have multiple threads at the same time active in same address space.
- Creating a different process is costlier as the system has to allocate different memory and resources to each process, but creating threads is easy as it does not require allocating separate memory and resources for threads of the same process.

2 a) What are the differences between Multithreading and Multitasking?

Or

2 b) Differentiate multithreading and multitasking.

Answer:

Parameter	Multithreading	Multitasking
Definition	Multithreading is to execute multiple threads in a process concurrently	Multitasking is to run multiple processes on a computer concurrently
Execution	In Multithreading, the CPU switches between multiple threads in the same process.	In Multitasking, the CPU Switches between multiple processes to complete the execution.
Resource sharing	In Multithreading, resources are shared among multiple threads in a process.	In Multitasking, resources are shared among multiple processes.
Complexity	Multithreading is light-weight and easy to create	Multitasking is heavy-weight and harder to create

3 a) Define thread.

Or

3 b) What is thread?

Answer:

A thread is a basic execution unit which has its own program counter, set of the register and stack. But it shares the code, data, and file of the process to which it belongs.

4 a)List the states of thread life cycle.

Or

4 b)Write the states of thread life cycle.

Answer:

A thread at any point of time exists in any one of the following states.

- New
- Runnable
- Blocked Waiting

- Timed Waiting
- Terminated

5 a) List some methods supported by threads.

Or

5 b) What are the important methods supported by threads?

Answer:

join(): It makes to wait for this thread to die. We can wait for a thread to finish by calling its join() method.

sleep(): It makes current executing thread to sleep for a specified interval of time. Time is in milli seconds.

yield(): It makes current executing thread object to pause temporarily and gives control to other thread to execute.

notify(): This method is inherited from Object class. This method wakes up a single thread that is waiting on this object's monitor to acquire lock.

notifyAll(): This method is inherited from Object class. This method wakes up all threads that are waiting on this object's monitor to acquire lock.

wait(): This method is inherited from Object class. This method makes current thread to wait until another thread invokes the notify() or the notifyAll() for this object.

6 a) Can we start a thread twice?

Or

6 b) Is it possible to start a thread twice?

Answer:

No. After starting a thread, it can never be started again. If we do so, an Illegal Thread-State Exception is thrown. In such case, thread will run once but for second time, it will throw exception.

7 a)What is the use of join() method?

Or

7 b) Why join method is used in java.

Answer:

The join() method waits for a thread to die. In other words, it causes the currently running threads to stop executing until the thread it joins with completes its task.

Syntax:

```
public void join()throws InterruptedException
public void join (long milliseconds) throws InterruptedException
```

8 a) Why do we need Synchronization?

Or

8 b) Why Synchronization is used in java?

Answer:

The synchronization is mainly used to

- To prevent thread interference.
- To prevent consistency problem.

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9 a)What are the types of Synchronization?

Or

9 b)List out the types of Synchronization in java.

Answer:

There are two types of synchronization:

- Process Synchronization
- Thread Synchronization

10 a)Write about Java synchronized method.

Or

10 b) Give a short note on java Synchronization method in java?

Answer:

- If we declare any method as synchronized, it is known as synchronized method.Synchronized method is used to lock an object for any shared resource.
- When a thread invokes a synchronized method, it automatically acquires the lock for that object and releases it when the thread completes its task.

11 a)What do you mean by Synchronized block in java?

Or

11 b) Define Synchronized block in java.

Answer:

Synchronized block can be used to perform synchronization on any specific resource of the method. Suppose we have 50 lines of code in your method, but we want to synchronize only 5 lines, we can use synchronized block.

If we put all the codes of the method in the synchronized block, it will work same as the synchronized method.

12 a) What is synchronization? Briefly explain.

Or

12 b) Define synchronization in java.

Answer:

Two or more threads accessing the same data simultaneously may lead to loss of data integrity. For example, when two people access a savings account, it is possible that one person may overdraw and the cheque may bounce. The importance of updating of the pass book can be well understood in this case.

13 a)What are the three ways in which a thread can enter the waiting state?

Or

13 b) List the three ways in which a thread can enter the waiting state.

Answer:

A thread can enter the waiting state by invoking its sleep() method, by blocking on I/O, by unsuccessfully attempting to acquire an object's lock, or by invoking an object's wait() method. It can also enter the waiting state by invoking its (deprecated) suspend() method.

14 a) What is daemon thread and which method is used to create the daemon thread?

Or

14 b) Define daemon thread. What is the method used to create daemon thread?

Answer:

Daemon thread is a low priority thread which runs intermittently in the back ground doing the garbage collection operation for the java runtime system. setDaemon method is used to create a daemon thread.

15 a) When you will synchronize a piece of your code?

Or

15 b) When a piece of your code is synchronized.

Answer:

When you expect your code will be accessed by different threads and these threads may change a particular data causing data corruption.

16 a) What is thread priority?

Or

16 b) Define thread priority.

Answer:

Thread Priority is an integer value that identifies the relative order in which it should be executed with respect to others. The thread priority values ranging from 1- 10 and the default value is 5. But if a thread have higher priority doesn't means that it will execute first. The thread scheduling depends on the OS.

17 a) How would you implement a thread pool?

Or

17 b) How the thread pool is implemented?

Answer:

The Thread Pool class is a generic implementation of a thread pool, which takes the following input Size of the pool to be constructed and name of the class which implements Runnable (which has a visible default constructor) and constructs a thread pool with active threads that are waiting for activation. once the threads have finished processing they come back and wait once again in the pool.

18 a) What is the difference between yielding and sleeping?

Or

18 b) Differentiate Yielding and sleeping in java.

Answer:

yielding	sleeping
yield will cause the thread to rejoin the queue	sleep hold the thread's execution for the specified time.
When a task is invoked in yielding, it returns to the ready state	When a task is invoked in sleeping, it returns to the waiting state.
It is used to get the running thread into out of runnable state with the same priority.	It is used to delay the execution for a period of time.

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19 a) What is Generics? List its advantages.

Or

19 b) Define generics. List its advantages.

Answer:

Generics are similar to templates in C++. Using Generics, the programmer can create a single class, interface or method that automatically works with all types of data (Integer, String, Float etc) i.e. the code can be reused for object of many different types.

Advantages of Generics:

- Generics make the code safer and easier to read.
- Type casting is not needed.
- It is checked at compile time. So problem will not be generated at run time.

20 a) How will you implement generic method in Java?

Or

20 b) How the generic method is implemented in Java?

Answer:

Generic methods are methods that can accept any type of argument.

Syntax:

```
<type-parameter> return_type method_name (parameters) {...}
```

Example:

```
public void display(T data)
{
    System.out.println(data);
}
```

21 a) What is the use of question mark in java Generics?

Or

21 b) Define Wild Card in Generics.

Answer:

The wildcard element is represented by ? and it specifies an unknown type i.e. it means any type.

For example,

```
<? extends Number>
```

specifies any child classes of class Number e.g. Integer, Float, double etc.

22 a) What do you mean by bounded type parameters?

Or

22 b) What are bounded type parameter?

Answer:

In Generics, bounded type parameter set restriction on the type that will be allowed to pass to a type-parameter.

Syntax:

```
<T extends superclass>
```

For example,

```
<T extends Number>
```

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In this example, the type parameter is restricted to any child classes of class Number e.g. Integer, Float, double etc.

23 a) What is Erasure?

Or

23 b) Define Erasure.

Answer:

The Java compiler applies type erasure to implement generic programming. It replaces all type parameters in generic types with their bounds or Object if the type parameters are unbounded.

Example: Java class with Generics

Example: T replaced by java.lang.Object class Gen<T>

24 a) List out the restrictions to be considered in generic programming.

Or

24 b) What are the restrictions to be considered in generic programming?

Answer:

- Cannot Instantiate Generic Types with Primitive Types
- Cannot Create Instances of Type Parameters
- Cannot Declare Static Fields Whose Types are Type Parameters
- Cannot Use Casts or instanceof With Parameterized Types
- Cannot Create Arrays of Parameterized Types
- Cannot Create, Catch, or Throw Objects of Parameterized Types

25 a) What are the various type parameters used in generics?

Or

25 b) List out the various type parameters used in generics.

Answer:

The type parameters naming conventions are important to learn generics thoroughly. The commonly used type parameters are as follows:

- T - Type
- E - Element
- K - Key
- N - Number
- V - Value

26 a) Define Generic class.

Or

26 b) Write the syntax for generic class.

Answer:

A generic class is a class with one or more type variables. A type variable T enclosed in angle brackets< > after the class name.

Example:

Public class Pair<T>

27 a) Why use generics in java?

Or

27 b) What is the need for generic code?

Answer:

- Stronger type checks at compile time
- Elimination of casts
- Enabling programmers to implement generic algorithms