1. Replain the components of the JDK ans components of JOK! (i) javae - The java Compiler, which translates your source code into loytecode. (ii) java - Executes longlecode on the Jum (iii) javap - used to examine the bytecode instructions of compiled Java dasses. (iv) jas - used to package your desses & related resources into a single file for distribution (v) javadoc - generated 4TML documentation from Java (vi) jdb - allons & to developers to debug Java appt 3. e Differentiate low JON JUM & JRE. tos > 8 (i) JOK: O Includes tools for developing Java apples. . It contains the compiles, suntime environment, and other development tools. (ii) Jum 1 . 9ts an abstract computing machine that provides the mintime environment in which Java bytecode can be executed. It is responsible for converting into machine code and managing memory. (iii) JPE: . 9ts a part of JDK + provides the nuntime environment for gave appl's.

of includes the JVM class libraries & other puntine components necessary to hun Java applications.

3. what is the role of the Turn in Java? I How does the Jum execute gave code? And in the gave is responsible for executing Java bytecode, making gava platform independent. (ii) It loads bytecode, verifies its integrity, and then executes it line by line using Just - in - line (JIT) (ii) The Jrm manages nemery allocation & garbage collection, ensuring efficient memory usage. (iv) It provides a secure execution environment by enforcing gava's becausily restrictions. 4. Explain the memory management gystem of the JVM. and I The Jun divides memory into marious regions, including the heap method area, stack & ratine method stacks. in) The heap is used for supramic memory allocations where objects are stored. It is managed by the gurbage cellector. (iii) the nethed area stored stores dass structures welched information, and constant pool date. (w) The method area stores dess structures, method information, and constant pool date. (v) The stack is used for storing invocation and local variables - Each thread has own stack. (vi) Nortine method stacks are used for native method or methods veritten in other languages

## & Fit Complex Chytedotoban

5 rehat age the JIT compiles & its role on the Jum? what is the bestocode and why is it important box gava?

9003 > (1) JIT ( gust - in - time ) compiles ?

St is a component of the JVM that compiles bytecode into machine code at runline for improved performance.

(ii) Sytecode:

9t is the intermediate as it allows Java programs to be executed on any devices with a Jum installed, begardless of the underlying hardwere and operating system.

6. Describe the architecture of the JVM. Ans Ti) The Jum architecture consists of various components, including class loader, mintime data areas Cheap wethod

areas, gtack), execution engine, and rative method

interface (JNI).

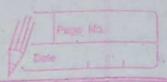
in the class loader load class files into menory dynamically.

(iii) Rentime data arisas manage memory allocation and storage for Jum execution.

(iii) The execution ergine executes bytecode instructions,

including interpretation & JIt compilation.

(v) The nature nethod interface allows Java code to call native code written in other languages.



7. How does gava achieve platform independence through
the JVM? the JUM ? And = (i) gava achienes pletforms independence by compiling sources code into bytecode, which is executed by the (ii) The Try provides an abstraction layer between gava porterade and the underlying hardwell and operating system, ensuing that Java programs can run on any platform with a compatible 50 m installed. of Sontido g. what is the significance of the dess bonder in gava? what is the provess of garbage collection in Charles bonder: back fooder:
(i) It is responsible for loading classes into the Jun dynamically.

(ii) 9t helps in achieving gava's dynamic extensibility and code reveability. garbage collection: in It is the process of reclaiming memory occupied by objects that are no longer in use. (ii) gava's garbage collector automatically manages memory allocation and deallocation, preventing memory leaks and improving memory efficiency.