Question 1 (b) : core concept of the TWSBR

Core concept of the two wheeler as with name is on the balncing part . Its actually like a inverted Pendulum
Essential to keep balonce or keeping the COM correct to balance that .

Professionally to be called Dynamically Balance : constantly adjusting its orientation and movement.
It involves real-time corrections to counteract any tipping forces.

It operates based on the inverted pendulum model, where the robot's body acts as an inverted pendulum that needs to be balanced on its wheels. The inverted pendulum is inherently unstable and requires continuous adjustment to stay upright.

Motors:

The robot's wheels are driven by motors, which receive control signals from the microcontroller. By adjusting the speed and direction of the wheels, the motors create the forces to maintain balance.

Also main concept now to travel or make it move , is also to gt the environment ffedback like the obstacle , that by the use of the sensors ,

Sensors:

The robot uses sensors such as gyroscopes and accelerometers to detect its orientation and motion. The gyroscope measures the rate of rotation, while the accelerometer measures the tilt angle relative to gravity.

. Sensor Fusion

To achieve accurate and reliable orientation data, sensor fusion techniques are used to combine readings from multiple sensors. Common algorithms for sensor fusion include the Complementary Filter, Kalman Filter, or Madgwick Filter.

Also the main thing is maintaing all this in real time

Real-Time Processing

It requires real-time processing of sensor data .

The control loop, which involves reading sensor data, computing control signals, and adjusting motor outputs, operate at a high frequency to do timely corrections.