

The Man Machine Interface (MMI) unit:

- (a) being the core of the CNC system, interprets the part program and executes interpolation, position control
- (b) is the sequence of instructions that describe the machining operations, in the form required by the CNC software
- (c) consists of the interface between the CNC machine tool and the user, displays the machine status, and offers functions for editing the part program and communication
- (d) controls the tool change, the spindle speed, the workpiece change, and the in/out signal processing

Considering the three degrees-of-freedom associated with the body-and-arm assembly of a robot, the most suitable robot configuration for painting operation is:

- (a) polar
- (b) articulated
- (c) SCARA
- (d) Cartesian

The fourth industrial revolution refers to:

- (a) the digital transformation of the production
- (b) the introduction of automation in manufacturing
- (c) the introduction of robots in manufacturing
- (d) the implementation of computer aided manufacturing

The most common method of homing for a linear axis of a CNC machine tool requires the use of:

- (a) a hardware reverse limit switch and the reference mark (zero track) of an encoder
- (b) a hardware reverse limit switch
- (c) a software limit switch
- (d) the reference mark (zero track) of an encoder

In the drum type tool magazine:

- (a) tool adapter disengagement is performed by a radial movement
- (b) up to 500 tools can be accommodated
- (c) tool change is carried out by a transfer arm
- (d) tool change is performed without tool change arm (spindle direct)

The aggregate production planning is concerned with the determination of production, inventory, and work force levels to meet fluctuating demand requirements over a:

- (a) short-term planning horizon
- (b) planning horizon related to the variability of demand
- (c) long-term planning horizon
- (d) medium-term planning horizon

Illustrate the evolution of the manufacturing systems in terms of automation and flexibility

The evolution of the manufacturing systems goes from mass production to mass customization.

In the first decades of industrial production, there were general-purpose machine tools, and pretty much everything was produced by hand using simple machines so the products had much variety. Thanks to the technological achievements in the manufacturing field the accuracy of the machines, material quality of the machine tools, and with the increasing demand mass production became more important around 1950, and with the dedicated manufacturing lines and logistics, globalization started.

After 1980 a new approach in manufacturing was introduced; flexible manufacturing systems. It made available the mass customization