



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## ELECTRICAL AND ELECTRONICS ENGINEERING

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	<b>INDUSTRIAL AUTOMATION AND CONTROL</b>
Course Code	:	<b>AEE511</b>
Program	:	<b>B. Tech</b>
Semester	:	<b>V</b>
Branch	:	<b>Electrical and Electronics Engineering</b>
Section	:	<b>A</b>
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Course Faculty	:	<b>Dr .V. CHANDRA JAGAN MOHAN, Professor, EEE</b>

#### OBJECTIVES:

I	Learn the fundamental concepts about introduction to industrial automation and control and devices.
II	Study the performance of each system in detail along with practical case studies.
III	Develop various types of industrial automation and control and devices.
IV	Understand the process control of PLC automation.

#### DEFINITIONS AND TERMINOLOGY QUESTION BANK:

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
<b>UNIT - I</b>						
<b>INTRODUCTION TO INDUSTRIAL AUTOMATION AND CONTROL</b>						
1	Describe automation.	Automation is the use of machines and technology to make processes run on their own without manpower.	Understand	CO1	CLO1	AEE511.01
2	List the benefits of automation.	Lower operating costs, robots can perform the work of three to five people, depending on the task, improved worker safety, reduced factory lead times etc.	Remember	CO1	CLO2	AEE511.02
3	Discuss the advantages of manual system.	Correcting entries may be easier with manual systems, as opposed to computerized ones that can leave complicated audit trails. The risk of corrupted data is much less. Data loss is less of a risk, particularly if records are stored in a fire-proof environment.	Remember	CO1	CLO5	AEE511.05
4	What is a measurement system?	A measurement system has been described as a system of related measures that enables the quantification of particular characteristics.	Remember	CO1	CLO6	AEE511.06
5	How the temperature of an object is measured?	The temperature of an object can be measured by direct contact or indirect by measuring the emitted energy of the object with non-contact infrared sensors.	Understand	CO1	CLO8	AEE511.08

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
6	How can pressure be measured?	The standard SI unit for pressure measurement is the Pascal (Pa) which is equivalent to one Newton per square meter (N/m <sup>2</sup> ) or the Kilopascal (kPa) where 1 kPa = 1000 Pa. In the English system, pressure is usually expressed in pounds per square inch (psi).	Remember	CO1	CLO9	AEE511.09
7	What are the types of pressure?	Absolute pressure, relative pressure and differential pressure.	Remember	CO1	CLO4	AEE511.04
8	What are the two types of air pressure?	There are two basic pressure types: absolute and gauge, distinguished by what pressure they are compared to, which is called the reference pressure. Gauge pressure's reference is ambient atmospheric pressure.	Remember	CO1	CLO5	AEE511.05
9	What is used to measure pressure?	There are a few different instruments used to measure air pressure. One common one is the barometer. Another type of pressure gauge is the Bourdon tube. It is used to measure the pressure of gases or liquids in a sealed container.	Understand	CO1	CLO8	AEE511.08
10	What are the types of pressure sensors?	There are two basic categories of analog pressure sensors, Force collector types These types of electronic pressure sensors generally use a force collector (such a diaphragm, piston, bourdon tube, or bellows) to measure strain (or deflection) due to applied force over an area (pressure).	Understand	CO1	CLO3	AEE511.03
11	How do you measure vacuum pressure?	The common metric unit for vacuum measurement is the milli bar, or mbar. Other pressure units sometimes used to express vacuum include the interrelated units of atmospheres, torr, and microns. One standard atmosphere equals 14.7 psi (29.92 in.-Hg).	Understand	CO1	CLO4	AEE511.04
12	What instrument measures liquid pressure?	Instruments used to measure pressure are called pressure gauges or vacuum gauges. A manometer could also be referring to a pressure measuring instrument, usually limited to measuring pressures near to atmospheric. The term manometer is often used to refer specifically to liquid column hydrostatic instruments.	Remember	CO1	CLO6	AEE511.06
13	What is sea level pressure?	Standard sea-level pressure, by definition, equals 760 mm (29.92 inches) of mercury, 14.70 pounds per square inch, $1,013.25 \times 10^3$ dynes per square centimeter, 1,013.25 millibars, one standard atmosphere, or 101.325 kilopascals.	Understand	CO1	CLO2	AEE511.02
14	How is force measured?	Forces can be measured using a device called force meter. The unit of force is called the Newton. It is represented by the symbol N. A force of 2N is smaller than 7N.	Remember	CO1	CLO8	AEE511.08

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
15	What are the uses of force in physics?	A force is a push or pulls those changes the motion of an object. Forces can make objects start or stop moving, cause objects that are already moving to speed up or slow down, or make objects change direction. Force arrows are used to represent both the magnitude and direction of forces.	Remember	CO1	CLO6	AEE511.06
<b>UNIT – II PROCESS CONTROL</b>						
1	How does process control work?	To stop any unwanted variation in a production process, a control loop monitors the process regularly to check it's performing as it should.	Remember	CO2	CLO3	AEE511.03
2	Why is process control necessary?	Process control technology allows manufacturers to keep their operations running within specified limits and to set more precise limits to maximize profitability, ensure quality and prioritize safety	Understand	CO2	CLO5	AEE511.05
3	What are the objectives of process control?	The primary objective of process control is to maintain a process at the desired operating conditions, safely and efficiently, while satisfying environmental and product quality requirements.	Understand	CO2	CLO1	AEE511.01
4	How does a PID controller work?	PID controller consists of three terms, namely proportional, integral and derivative control. The combined operation of these three controllers gives control strategy for process control. PID controller manipulates the process variables like pressure, speed, temperature, flow, etc.	Remember	CO2	CLO2	AEE511.02
5	What is the advantage of PID controller?	Here are some advantages which are very helpful for you. The advantage of PID controller is its feasibility and easy to be implemented. This is an useful function recently added to PLC. You can use it for any kind of control tasks that require PID controller such as DC motor speed, Oven temperature.	Understand	CO2	CLO4	AEE511.04
6	Why we use PID controller?	They are used in most automatic process control applications in industry. PID controllers can be used to regulate flow, temperature, pressure, level, and many other industrial process variables.	Understand	CO2	CLO8	AEE511.08
7	What are the disadvantages of PID controller?	Excessive proportional action causes a faltering or hesitation, excessive integral action causes overshoot, and excessive derivative action causes an oscillatory approach to set point.	Understand	CO2	CLO6	AEE511.06
8	How do I tune my PID controller?	Set all gains to zero. Increase the P gain until the response to a disturbance is steady oscillation. Increase the D gain until the oscillations go away (i.e. it's critically damped).Repeat steps 2 and 3 until increasing the D gain does not stop the oscillations.	Understand	CO2	CLO8	AEE511.08

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
9	What is feed forward feedback?	Feed forward consists in providing future-oriented options or solutions.	Remember	CO2	CLO9	AEE511.09
10	What is ratio controller?	A ratio controller is a special type of feed forward controller where disturbances are measured and their ratio is held at a desired set point by controlling one of the streams.	Understand	CO2	CLO7	AEE511.07
11	What is a Control Structure?	Structured programming requires the use of special structures that control the flow through a program. These control structures include; Sequence.	Understand	CO2	CLO5	AEE511.05
12	What is Model predictive control?	Model predictive control (MPC) is an advanced method of process control that is used to control a process while satisfying a set of constraints. Model predictive controllers rely on dynamic models of the process, most often linear empirical models obtained by system identification.	Remember	CO2	CLO6	AEE511.06
13	What is inverse response?	When the initial response of a dynamic system is in a direction opposite to the final outcome, it is called an inverse response.	Remember	CO2	CLO1	AEE511.01
14	What is meant by P controller?	Proportional control is a control system technology based on a response in proportion to the difference between what is set as a desired process variable (or set point) and the current value of the variable.	Remember	CO2	CLO2	AEE511.02
15	What is a PI controller?	A PI Controller is a feedback control loop that calculates an error signal by taking the difference between the output of a system, which in this case is the power being drawn from the battery, and the set point.	Understand	CO2	CLO5	AEE511.05
<b>UNIT – III</b>						
<b>PROGRAMMABLE LOGIC CONTROL SYSTEMS</b>						
1	What is a PLC?	A Programmable Logic Controller, or PLC, is a ruggedized computer used for industrial automation.	Understand	CO3	CLO4	AEE511.04
2	How PLCs Work?	A programmable logic controller is a specialized computer used to control machines and processes. Unlike a personal computer though the PLC is designed to survive in a rugged industrial atmosphere and to be very flexible in how it interfaces with inputs and outputs to the real world.	Remember	CO3	CLO2	AEE511.02
3	What is the basic of PLC?	Basic PLC operation. The basic elements of a PLC include input modules or points, a Central Processing Unit (CPU), output modules or points, and a programming device.	Remember	CO3	CLO3	AEE511.03
4	What is PLC advantage?	One single Programmable Logic Controller can easily run many machines. With PLC control any change in circuit design or sequence is as simple as retyping the logic. Correcting errors in PLC is extremely short and cost effective.	Remember	CO3	CLO5	AEE511.05

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
5	Why do PLCs fail?	Common reasons why PLC control systems fail include module failure, power outages and bad network connections. PLC failure issues can also stem from overheating, moisture and electromagnetic interference.	Remember	CO3	CLO8	AEE511.08
6	What is the need of PLC?	Need of programmable logic controller (PLC) in automation. PLC is used in the fully automated industries or plants or process, the actual processes handled and controlled by the controllers which are nothing but the programming logic controllers that means PLC plays a very important role in automation section.	Understand	CO3	CLO9	AEE511.09
7	What is sequence control?	Sequence control refers to user actions and computer logic that initiate, interrupt, or terminate transactions.	Remember	CO3	CLO1	AEE511.01
8	What is sequential function chart in PLC?	Sequential function chart (SFC) is a graphical programming language used for programmable logic controllers (PLCs).	Remember	CO3	CLO6	AEE511.06
9	What is sequential flowchart?	A flow chart is a visually descriptive overview or diagram used to express sequential actions related to some process or algorithm.	Remember	CO3	CLO9	AEE511.09
10	What is function block in PLC programming?	The term function block diagram (FBD) is used for PLC programs described in terms of graphical blocks. It is described as a graphical language for depicting signal and data flows through blocks, which are reusable software elements.	Understand	CO3	CLO4	AEE511.04
11	Which language is used in PLC programming?	The majority of PLC systems today adhere to the IEC 61131/3 control systems programming standard that defines 5 languages: Ladder Diagram (LD), Structured Text (ST), Function Block Diagram (FBD), Instruction List (IL) and sequential function chart (SFC).	Remember	CO3	CLO6	AEE511.06
12	What is a function diagram?	A function is a special type of relation in which each element of the domain is paired with exactly one element in the range .	Remember	CO3	CLO2	AEE511.02
13	What is the IEC 61131 3 standard protocol?	IEC 61131-3 is the first vendor independent standardized programming language for industrial automation. Established by the International Electro technical Commission (IEC) a worldwide standard organization founded in 1906 and recognized worldwide for standards in the controls industry by over 50 countries.	Remember	CO3	CLO7	AEE511.07
14	How does ladder logic work?	Execution of Ladder Logic. Typically before starting to execute the logic, the CPU reads the physical inputs tied to the I/O	Understand	CO3	CLO9	AEE511.09

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		modules to update their status in the CPU's memory table. Then, starting at the top left of the program, the CPU works its way down the rail executing each rung or sub rung from left to right.				
15	What is the purpose of a block diagram?	A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks. They are heavily used in engineering in hardware design, electronic design, software design, and process flow diagrams.	Remember	CO3	CLO6	AEE511.06
<b>UNIT – IV</b>						
<b>CNC MACHINES AND ACTUATORS</b>						
1	What is meant by CNC machine?	CNC means Computer Numerical Control. This means a computer converts the design produced by Computer Aided Design software (CAD), into numbers. The numbers can be considered to be the coordinates of a graph and they control the movement of the cutter.	Remember	CO4	CLO6	AEE511.06
2	What is CNC machine and how it works?	A CNC, or computer numerical control machine is a high precision tool that's computer-controlled and makes repeated, accurate movements. It does so by taking computer-generated code and converting it with software to electrical signals.	Understand	CO4	CLO8	AEE511.08
3	What is the purpose of CNC machine?	CNC machining is a manufacturing process in which pre-programmed computer software dictates the movement of factory tools and machinery. The process can be used to control a range of complex machinery, from grinders and lathes to mills and routers.	Understand	CO4	CLO2	AEE511.02
4	Why CNC Machining is Important for Manufacturing?	Computer Numerical Control (CNC) refers to - manipulating traditional machines by the use of computer systems. Since computers are used to control machines, it means that all major operations of production can be automated to increase speed and quality of manufacturing.	Understand	CO4	CLO5	AEE511.05
5	What is CNC type?	There are various types of CNC machines, some of them are: Router - A CNC router can engrave wood, metal, or plastic and is a very common type of CNC machine. Laser - CNC laser cutters operate quite like CNC plasma cutters, but instead, a laser is used to cut the wood or metal.	Remember	CO4	CLO1	AEE511.01
6	Differentiate NC and CNC.	NC stands for Numerical Control whereas CNC stands for Computer Numerical Control. In NC Machine the programs are	Understand	CO4	CLO3	AEE511.03

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		fed into the punch cards. But in CNC machine the programs are fed directly into the computer with the help of a small keyboard similar to our traditional keyboard.				
7	What is CNC material?	Materials Used: Almost any material can be used in a CNC machine. It really depends on the application. Common materials include metals such as aluminum, brass, copper, steel, and titanium, as well as wood, foam, fiberglass, and plastics such as polypropylene.	Remember	CO4	CLO9	AEE511.09
8	What is the advantage of CNC machine?	Manufacturing finds CNC machining particularly useful because the industry needs large amounts of metal and plastic parts, often in complex shapes. A variety of CNC machines offer the advantage of having multiple axes that can adjust to difficult angles and help manage hard-to-cut materials.	Understand	CO4	CLO5	AEE511.05
9	What is CNC full form?	CNC: Computerized Numerical Control. CNC stands for Computerized Numerical Control. It is a controlling system with digital electronic computers used to control machines.	Understand	CO4	CLO7	AEE511.07
10	What is a control valve and how does it work?	Control valves regulate the flow of a liquid or gas by opening or closing internal passages. They form part of a control loop used to control a process. The control valves respond to instructions from the controller and adjust the internal openings accordingly.	Remember	CO4	CLO2	AEE511.02
11	What is control valve and its types?	Control Valves A Control Valve There are two basics in a power-operated device used to modify the fluid flow rate in a process system. types of control valves Control Valve a) Rotary motion valves having ball, butterfly or plug type closures. b) Linear motion valves having globe , diaphragm or pinch type closures.	Remember	CO4	CLO6	AEE511.06
12	What is the difference between control valve and on off valve?	XV's are supposed to be ON/OFF valves, typically solenoid operated, whereas control valves are used to vary the flow. XV valves are on/off valves that are typically used to quickly isolated a fluid and typically provide right shut off capabilities. They are not used to modulate or vary the flow.	Remember	CO4	CLO3	AEE511.03
13	What is modulating control valve?	A modulating control valve is an automated valve that is used to control the amount of flow in a system or process.	Understand	CO4	CLO5	AEE511.05

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		A control signal is sent to the actuator to instruct it on how far to raise or turn the stem. The control signal may be in the form of air pressure, or electrical voltage.				
14	What is the purpose of a control valve?	A control valve is a valve used to control fluid flow by varying the size of the flow passage as directed by a signal from a controller. This enables the direct control of flow rate and the consequential control of process quantities such as pressure, temperature, and liquid level.	Remember	CO4	CLO7	AEE511.07
15	What is Valve and its function?	A valve is a device that regulates, directs or controls the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways.	Understand	CO4	CLO2	AEE511.02
<b>UNIT – V</b>						
<b>ELECTRICAL MACHINE DRIVES</b>						
1	What is drive in machine?	It is important to distinguish between motors and drives. A motor is the mechanical or electrical device that generates the rotational or linear force used to power a machine. A drive is the electronic device that harnesses and controls the electrical energy sent to the motor.	Remember	CO5	CLO7	AEE511.07
2	What do variable speed drives do?	A Variable Frequency Drive (VFD) is a type of motor controller that drives an electric motor by varying the frequency and voltage supplied to the electric motor. Other names for a VFD are variable speed drive, adjustable speed drive, adjustable frequency drive, AC drive, micro drive, and inverter.	Remember	CO5	CLO9	AEE511.09
3	What is the difference between VSD and VFD?	A variable frequency drive (VFD) refers to AC drives only and a variable speed drive (VSD) refers to either AC Drives or DC Drives. VFDs vary the speed of an AC motor by varying the frequency to the motor. VSDs referring to DC motors vary the speed by varying the voltage to the motor.	Understand	CO5	CLO8	AEE511.08
4	How does a VFD work on a pump?	A variable frequency drive is used for adjusting a flow or pressure to the actual demand. It controls the frequency of the electrical power supplied to a pump or a fan. Significant power savings can be achieved when using a VFD. It controls the frequency of the electrical power supplied to the motor.	Remember	CO5	CLO6	AEE511.06
5	Can any AC motor be variable speed?	The speed of any AC motor is dependent on the applied frequency. However, some AC motors are just not suitable for variable speed operation. Smaller still, standard low-voltage variable frequency drives can now control permanent magnet synchronous motors in addition to induction motors.	Understand	CO5	CLO2	AEE511.02



S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
6	Can any DC motor be variable speed?	In general if you don't do anything special to it, a DC motor will have variable speed. The main factors are the DC voltage applied to the armature coil and the amount of torque load you are trying to drive. In order to make it into a constant speed DC motor you have to have some sort of electronic feedback.	Understand	CO5	CLO3	AEE511.03
7	How does a variable speed controller work?	A variable frequency drive (VFD) is a type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply. The VFD also has the capacity to control ramp-up and ramp-down of the motor during start or stop, respectively.	Understand	CO5	CLO4	AEE511.04
8	What is the difference between motor and drive?	A drive is the electronic device that harnesses and controls the electrical energy sent to the motor. The drive feeds electricity into the motor in varying amounts and at varying frequencies, thereby indirectly controlling the motor's speed and torque. Together, a motor and drive form a "drive system."	Remember	CO5	CLO5	AEE511.05
9	Can a single phase motor be variable speed?	Speed control of single phase induction motors is desirable in most motor control applications since it not only provides variable speed but also reduces energy consumption and audible noise. Permanent Split Capacitor motors are the most popular type of single phase induction motors.	Remember	CO5	CLO6	AEE511.06
10	What is use of actuator?	An actuator typically is a mechanical device that takes energy — usually energy that is created by air, electricity or liquid — and converts it into some kind of motion. Actuators typically are used in manufacturing or industrial applications and might be used in devices such as motors, pumps, switches and valves.	Remember	CO5	CLO8	AEE511.08
11	What are different types of actuators?	A valve actuator is a mechanical device that uses a power source to operate a valve. This power source can be electric, pneumatic (compressed air), or hydraulic (the flow of oil). There are two main types of actuators, one for each of the two main types of valves that require them. They are rotary and linear.	Understand	CO5	CLO4	AEE511.04
12	What do you mean by actuator?	An actuator is a device that moves or controls some mechanism. An actuator turns a control signal into mechanical action such as an electric motor. Actuators may be based on hydraulic, pneumatic, electric, thermal or mechanical means, but are increasingly being driven by software.	Understand	CO5	CLO1	AEE511.01
13	What is the difference between sensors and actuators?	A sensor is a device that changes a physical parameter to an electrical output. As against, an actuator is a device that converts an electrical signal to a physical output. Sensor generates electrical signals while an actuator results in the production of	Understand	CO5	CLO8	AEE511.08

S. No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		energy in the form of heat or motion.				
14	Describe spring actuator?	Spring Boot Actuator includes a number of additional features to help you monitor and manage your application when it's pushed to production. You can choose to manage and monitor your application using HTTP or JMX endpoints.	Remember	CO5	CLO9	AEE511.09
15	Is servo motor An actuator?	A servo motor actuator regulates the speed of a fuel-powered car or aircraft by rotating a shaft connected to engine throttle. Servo motor actuators are also found in devices we use every day.	Understand	CO5	CLO6	AEE511.06

**Signature of the Faculty**

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