INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**POWER PLANT CONTROL AND INSTRUMENTATION**
Course Code	:	**AEE516**
Program	:	**B.Tech**
Semester	:	**VII**
Branch	:	**Electrical and Electronics Engineering**
Section	:	**A**
Academic Year	:	**2019 - 2020**
Course Faculty	:	**Dr. Mule Laxmidevi Ramanaiah, Associate Professor**

COURSE OBJECTIVES:

The course should enable the students to:	
I	Assess different methods of power generation.
II	Discuss measurement of electrical and non-electrical parameters involved in power generation plants
III	Illustrate the different types of devices used for data acquisition and analyze in power plants.
IV	Describe control system and control loops applied in power plants.
V	Integrate monitoring of different parameters like speed, vibration of turbines and their control.

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT -I OVERVIEW OF POWER GENERATION						
1	What is the definition of power generation?	The process of conversion of energy in one form to electrical energy is known as power generation.	Remember	CO 1	CLO 1	AEE516.01
2	What are the types of power generation sources?	The types of power generation sources are renewable and non-renewable sources.	Remember	CO 1	CLO 1	AEE516.01
3	What is BU in power generation	The British thermal unit (Btu or BTU) is a traditional unit of heat; it is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit	Remember	CO 1	CLO 1	AEE516.01
4	What is hydroelectric energy and how does it work?	Hydropower plants capture the energy of falling water to generate electricity. A turbine converts the kinetic energy of fallingwater into mechanical energy. Then a	Remember	CO 1	CLO 1	AEE516.01

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		generator converts the mechanical energy from the turbine into electrical energy.				
5	Is hydroelectric energy renewable?	It's renewable because it uses the Earth's water cycle to generate electricity	Understand	CO 1	CLO 1	AEE516.01
6	Is Hydro Clean Energy?	Many countries consider hydroelectricity a clean source of power because it doesn't involve burning dirty fossil fuels. But that's far from true.	Understand	CO 1	CLO 1	AEE516.01
7	What is the definition of thermal energy?	Thermal energy is an example of kinetic energy, as it is due to the motion of particles, with motion being the key. Thermal energy can be transferred from one object to another in the form of heat.	Remember	CO 1	CLO 1	AEE516.01
8	What is Thermal Power? How is it produced?	Thermal generators or specially designed furnaces produce this thermal electricity. Thermal power plant burn fuels to boil water and make steam. The steam is then used to spin a turbine which is connected to a generator that weaves electricity.	Remember	CO 1	CLO 1	AEE516.01
9	What are the units of thermal energy?	Thermal energy itself is expressed in British thermal units (Btu), calories and joules. One Btu is the amount of heat necessary to raise 1 lb. of water through 1 degree Fahrenheit. A calorie is the amount of thermal energy needed to raise the temperature of 1 gram of water by 1 degree Celsius.	Remember	CO 1	CLO 1	AEE516.01
10	Which type of coal is used in thermal power plants?	Lignite coal. Generally coal is used as a major fuel in mostly all the thermal power plants because it's the most abundant fossil fuel, easily available at relatively low cost. For electric power generation; lignite coal is generally used. Bituminous coal is also used sometimes depending upon the availability.	Understand	CO 1	CLO 1	AEE516.01
11	Who invented thermal energy?	James Prescott Joulewas the first scientist to discover that heat is a type of energy. While studying the relationship between heat, work, and temperature, he was experimenting with fluids like water. He found that when he agitated the fluid, its temperature increased.	Understand	CO 1	CLO 1	AEE516.01
12	What are the different types of coal?	There are four main coal types: lignite, sub-bituminous, bituminous and anthracite.	Remember	CO 1	CLO 1	AEE516.01

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13	Why is coal bad for you?	Air pollution from coal-fired power plants is linked with asthma, cancer, heart and lung ailments, neurological problems, acid rain, global warming, and other severe environmental and public health impacts.	Understand	CO 1	CLO 1	AEE516.01
14	Define cogeneration.	Cogeneration works on the concept of producing two different form of energy by using one single source of fuel. Out of these two forms one must be heat or thermal energy and other one is either electrical or mechanical energy.	Remember	CO 1	CLO 3	AEE516.03
15	Define piping and instrumentation diagram.	A piping and instrumentation diagram (P&ID) is a detailed diagram in the process industry which shows the piping and process equipment together with the instrumentation and control devices.	Remember	CO 1	CLO 2	AEE516.02
UNIT – II MEASUREMENTS IN POWER PLANTS						
1	What is electrical measuring instrument?	The instruments used to measure any quantity are known as measuring instruments. If he instruments can measure the basic electrical quantities, such as voltage and current are known as basic electrical measuring instruments.	Remember	CO 2	CLO 4	AEE516.04
2	What are the 3 quantities of electricity?	The basic electrical quantities are electrical current and voltage, electrical charge, resistance, capacitance, inductance and electric power.	Remember	CO 2	CLO 4	AEE516.04
3	Which device is used to measure current?	Ammeter - An instrument for measuring the flow of electrical current in amperes.	Remember	CO 2	CLO 4	AEE516.04
4	What is water flow meter?	A flow meter is a device used to measure the volume or mass of a gas or liquid.	Remember	CO 2	CLO 5	AEE516.05
5	How many types of flow meter are there?	5 Types of Flow Meters. Measuring a flow is critical, especially in industrial plants, where it can define the profit or loss of company. A flow meter is a device used to measure flow rate (volumetric or mass) or the quantity of fluids passing through a pipe.	Understand	CO 2	CLO 5	AEE516.05
6	What is the unit of water?	There are two basic units of water measurement from a water management perspective.	Remember	CO 2	CLO 5	AEE516.05

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		For water that is in motion, cubic feet per second is the unit of measure. For water that is stored or impounded, the acre-foot is how water is measured.				
7	What device measures the flow rate of gases?	A flow meter is a precision instrument that measures the rate of gas flow or (liquid flow) in a pipe. There are three main meter styles for flow measurement: Positive displacement meters collect a fixed volume of fluid, then release and refill the fluid, then tally how many times the volume is filled to determine flow.	Understand	CO 2	CLO 5	AEE516.05
8	What is a fuel flow meter?	Fuel flow meters offer a compact, light weight and very cost-effective solution for measuring fuel consumption and operating time of vehicles, tractors, river vessels or any mobile or fixed installations with diesel engines.	Remember	CO 2	CLO 5	AEE516.05
9	How do you calculate air flow?	To calculate Air Flow in Cubic Feet per Minute (CFM), determine the Flow Velocity in feet per minute, then multiply this figure by the Duct Cross Sectional Area.	Understand	CO 2	CLO 5	AEE516.05
10	How steam flow is measured?	Pressure is measured upstream and downstream from the orifice plate with a DP transmitter, which then calculates the flow rate.	Understand	CO 2	CLO 5	AEE516.05
11	How does a steam flow meter work?	A flow meter works by measuring the amount of a liquid, gas, or steam flowing through or around the flow meter sensors.	Understand	CO 2	CLO 5	AEE516.05
12	What is steam pressure?	Steam is water in the gas phase, which is formed when water boils or evaporates. At lower pressures, such as in the upper atmosphere or at the top of high mountains, water boils at a lower temperature than the nominal 100 °C (212 °F) at standard pressure. If heated further it becomes superheated steam.	Remember	CO 2	CLO 5	AEE516.05
13	How superheated steam is generated?	To produce superheated steam in a power plant or for processes (such as drying paper) the saturated steam drawn from a boiler is passed through a separate heating device (a superheated) which transfers additional heat to the steam by contact or by radiation. This is	Understand	CO 2	CLO 5	AEE516.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		because the superheated steam is dry.				
14	What is drum level control?	The purpose of the drum level controller is to bring the drum up to level at boiler start-up and maintain the level at constant steam load.	Remember	CO 2	CLO 5	AEE516.05
15	What is swelling in boiler?	The increase and decrease in the water level caused by the pressure change are commonly referred to as the swell and shrink reactions.	Understand	CO 2	CLO 5	AEE516.05
UNIT – III ANALYSERS IN POWER PLANTS						
1	What is oxygen Analyzer?	An oxygen analyzer is a device that measures the level of oxygen in a system, therefore determining if the level needs to be increased or not. It uses a kind of oxygen sensor for its functioning. An analyzer uses a sensor cell constructed of ceramic material to measure oxygen level.	Remember	CO 3	CLO 7	AEE516.07
2	What is flue gas analyzer?	A portable electronic device, a flue gas analyzer measures and displays the products of combustion from both domestic and commercial fossil fuelled appliances. Additionally, they can measure the ambient air quality in rooms or buildings.	Remember	CO 3	CLO 7	AEE516.07
3	What is a flue gas?	Flue gas is the gas exiting to the atmosphere via a flue, which is a pipe or channel for conveying exhaust gases from a fireplace, oven, furnace, boiler or steam generator. Quite often, the flue gas refers to the combustion exhaust gas produced at power plants.	Remember	CO 3	CLO 7	AEE516.07
4	Is flue gas toxic?	Excessive soot can cause chimneyfires, flue deterioration, and chimney blockages that direct toxic fumes back into the house and cause inefficient furnace operation.	Understand	CO 3	CLO 7	AEE516.07
5	Why silica oil and dissolved gases should not be present in boiler feed water?	Silica (sand)if present in water ca n form exceedingly hard scale. Suspended or dissolved iron coming in the feed water will also deposit on the boiler metal. Oil and other process contaminants can form deposits as well and promote deposition of other impurities.	Understand	CO 3	CLO 8	AEE516.08

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6	Why boiler feed water is treated?	Boiler water is treated to prevent scaling, corrosion, foaming, and priming.	Understand	CO 3	CLO 8	AEE516.08
7	Why does silica increase in boiler drum?	The silica concentration is distributed between the water and vapour phases in a boiler. As the temperature and pressure are increased, more silica becomes present in the steam. The silica monitoring in the boiler drum is one parameter which can be used to control blow down	Understand	CO 3	CLO 8	AEE516.08
8	What is silica in boiler water?	Silica, in amounts ranging from less than 1 to over 100 ppm, is found in all natural water supplies.	Understand	CO 3	CLO 7	AEE516.07
9	How do you remove silica from boiler water?	Ion exchange will remove this as long as the anion resin is the strong base type. Silica in deionizer water can easily be reduced to 20-50 ppb. Reverse osmosis will also remove silica by 90-98%.	Understand	CO 3	CLO 8	AEE516.08
10	Why is water softened before using in boiler?	A water softener removes hard water minerals, like calcium and magnesium, which can cause scaling and damage in the boiler tubes.	Understand	CO 3	CLO 8	AEE516.08
11	What should be the pH of boiler feed water?	Boiler water pH refers to a quantitative figure that expresses the acidity or alkalinity of boiler water. Ideally it should be between 8.5 and 9.5. If the pH is lower than that, the boiler water will start eating the pipes and attacks the boiler equipments as well.	Understand	CO 3	CLO 8	AEE516.08
12	Can you drink boiler water?	The answer to this question is quite simple if water is from the main supply then yes you can drink it but if the water in your combi-boiler is fed from storage tank then it is no.	Understand	CO 3	CLO 7	AEE516.07
13	What is chromatography ?	Chromatography is used to separate mixtures of substances into their components	Remember	CO 3	CLO 8	AEE516.08
14	What is a pH meter and what is it used for?	PH meter, electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution.	Remember	CO 3	CLO 8	AEE516.08
15	What is the unit of pollution?	Pollutants are measured in the following units: particle concentrations – micrograms per cubic metre (µg/m3) gases – parts per million (ppm) for CO and parts per hundred million (pphm) for others. NEPH or visibility – reported in units of 10-4 m-1, i.e.,	Remember	CO 3	CLO 9	AEE516.09

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		a NEPH value of 2.5 is actually equal to 2.5 x 10-4 m-1.				
UNIT – IV CONTROL LOOPS IN BOILERS						
1	What is combustion control?	Boilers are often the principal steam or hot water generator system used in industrial plant or commercial heating. Consequently, they must be designed to operate efficiently and safely whilst responding rapidly to any change in demand.	Remember	CO 4	CLO 10	AEE516.10
2	What is the best air fuel ratio?	The stoichiometric air-fuel ratio (14.7:1) that is the ideal ratio for lowest emissions, but this isn't the best ratio for power.	Remember	CO 4	CLO 10	AEE516.10
3	What is furnace draft control?	Draft regulators or barometric dampers are devices used to regulate the draft on oil-fired furnaces, boilers, and water heaters. You adjust the weight to control the amount of the opening of this damper which in turn controls the amount of excess air that can enter the flue and chimney when the oil burner is operating.	Remember	CO 4	CLO 11	AEE516.11
4	What is a forced draft fan?	Forced Draft Fan is a type of a fan supplying pressurized air to a system.	Remember	CO 4	CLO 11	AEE516.11
5	What is drum level control?	Boiler Drum Level Control. The purpose of the drum level controller is to bring the drum up to level at boiler start-up and maintain the level at constant steam load. A dramatic decrease in this level may uncover boiler tubes, allowing them to become overheated and damaged.	Remember	CO 4	CLO 11	AEE516.11
6	What is shrink and swell in boilers?	Dynamic shrink/swell is a phenomenon that produces variations in the level of the liquid surface in the steam drum whenever boiler load (changes in steam demand) occur. This behavior is strongly influenced by the actual arrangement of steam generating tubes in the boiler.	Remember	CO 4	CLO 11	AEE516.11
7	Why does starvation occur in a steam boiler?	The answer to that is when there is not sufficient water level in boiler.	Understand	CO 4	CLO 11	AEE516.11
8	What is main steam system?	The purpose of the main steam system is to provide steam from the source (reactor, steam generator or steam separator) to the turbine.	Remember	CO 4	CLO 11	AEE516.11

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9	What are boiler interlocks?	A Boiler Interlock is an arrangement of heating controls. It ensures the boiler does not fire when there is no demand for heat.	Remember	CO 4	CLO 12	AEE516.12
10	What does purging a boiler mean?	Purging a boiler is a simple way of saying that you are going to get the air out of it so the water can run freely.	Understand	CO 4	CLO 11	AEE516.11
11	What is interlock and protection?	The interlock and protection system is used to ensure safety of equipment and personnel as well as stable operation of a unit.	Remember	CO 4	CLO 12	AEE516.12
12	What causes air in boiler system?	Air in the boiler system is usually the cause of strange banging or whistling noises from your boiler (though low pressure and kettling can also be at fault).	Understand	CO 4	CLO 11	AEE516.11
13	What is the function of super heater?	A super heater is a device used to convert saturated steam or wet steam into superheated steam or dry steam.	Understand	CO 4	CLO 11	AEE516.11
14	What is the function of economizer?	A common application of economisersin steam power plants is to capture the waste heat from boiler stack gases (flue gas) and transfer it to the boiler feed water.	Understand	CO 4	CLO 11	AEE516.11
15	Why reheating of steam is required?	The main purpose of reheating is to avoid excess moisture in steam at the end of expansion to protect the turbine.	Understand	CO 4	CLO 11	AEE516.11
UNIT – V TURBINE MONITORING AND CONTROL						
1	What is turbine?	A turbine is a turbo machine with at least one moving part called a rotor assembly, which is a shaft or drum with blades attached.	Remember	CO 5	CLO 15	AEE516.15
2	What is the function of turbine?	The Turbine has one major function: Convert the energy from the high pressure steam to mechanical energy in the form of shaft rotation so that the generator will turn.	Understand	CO 5	CLO 15	AEE516.15
3	Where are turbines used?	Turbines are used in many different areas, and each type of turbine has a slightly different construction to perform its job properly. Turbines are used in wind power, hydropower, in heat engines, and for propulsion. Turbines are extremely important because of the fact that nearly all electricity is generated by them.	Understand	CO 5	CLO 15	AEE516.15

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4	What are reaction turbines?	A reaction turbine is a type of turbine that develops torque by reacting to the pressure or weight of a fluid.	Remember	CO 5	CLO 15	AEE516.15
5	What are the types of turbine?	There are 3 main types of impulse turbine in use: the Pelton, the Turgo and the Cross flow turbine. The two main types of reaction turbine are the propeller turbine. The reverse Archimedes Screw and the overshot waterwheel are both gravity turbines.	Understand	CO 5	CLO 15	AEE516.15
6	What is high head turbine?	Higher the head, higher the turbine capacity to rotate (rpm). This is known as Hydraulic head difference and it represents the amount of energy that can be transformed into electricity by turbine i.e, higher the head difference higher the electricity production.	Remember	CO 5	CLO 15	AEE516.15
7	What is runaway speed of turbine?	The runaway speed of a water turbine is its speed at full flow, and no shaft load.	Remember	CO 5	CLO 15	AEE516.15
8	What are the reasons for high vibrations in steam turbines?	The effect of a permanent shaft bend caused by uneven cooling will immediately appear as high rotor vibration at the next startup. The vibration is caused by insufficient clearance between stationary and rotating parts, as well as a shaft located off-center in its bearing.	Understand	CO 5	CLO 15	AEE516.15
9	What is difference between reaction and impulse turbine?	The basic and main difference between impulse and reaction turbine is that there is pressure change in the fluid as it passes through runner of reaction turbine while in impulse turbine there is no pressure change in the runner. So it uses kinetic energy as well as pressure energy to rotate the turbine.	Understand	CO 5	CLO 14	AEE516.14
10	How does temperature affect oil?	In general, liquids tend to get “thinner” when their temperature increases.	Understand	CO 5	CLO 13	AEE516.13
11	What temperature does oil viscosity change?	Oil weight, or viscosity, refers to how thick or thin the oil is. The temperature requirements set for oil by the Society of Automotive Engineers (SAE) is 0 degrees F(low) and 210 degrees F (high).	Understand	CO 5	CLO 13	AEE516.13
12	What is the operating pressure of a steam boiler?	Residential steam heating systems are almost always designed to operate at very low pressures, typically around 0.2 psi to a maximum of 0.5 psi – i.e., 1/2 of one psi.	Remember	CO 5	CLO 13	AEE516.13

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13	Is it cheaper to leave heating on low all day?	According to experts at the Energy Saving Trust, as well as British Gas, the idea that it's cheaper to leave the heating on low all day is a myth. They're clear that having the heating on only when you need it is, in the long run, the best way to save energy, and therefore money.	Understand	CO 5	CLO 13	AEE516.13
14	What temperature is a heat pump not effective?	The heat pump is effective by itself down to temperatures around 25 to 30 degrees Fahrenheit. At that point, either a gas furnace or an air handler with supplemental electric heat will kick in and help heat your home.	Understand	CO 5	CLO 13	AEE516.13
15	What is the correct pressure for a boiler?	When the heating system is cool, the pressure should be between 1 and 1.5 bar on the pressure gauge (the indicator needle would usually be in the green section). If pressure is below 0.5 bar (down in the red section), water has been lost from the system and must be replaced.	Understand	CO 5	CLO 14	AEE516.14

Signature of the Faculty **HOD, EEE**