



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	ELECTRICAL POWER GENERATION SYSTEMS
Course Code	:	AEEB14
Program	:	B. Tech
Semester	:	IV
Branch	:	Electrical and Electronics Engineering
Section	:	A&B
Course Faculty	:	Dr. V Chandra Jagan Mohan, Associate Professor Ms. T Saritha Kumari, Assistant Professor

COURSE OBJECTIVES:

The course should enable the students to:	
I	Demonstrate various conventional power generation systems including major subsystems.
II	Understand hydroelectric power generation systems along with pumped storage plants and hydraulic turbines.
III	Apply knowledge of solar and wind power generation systems in design and implementation to obtain clean energy.
IV	Illustrate the economic aspects of power generation and power tariff methods.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT - I CONVENTIONAL POWER GENERATION SYSTEMS						
1	Potential energy of water is used to drive the turbine?	When waterfalls, potential energy of water is converted into kinetic energy. This kinetic energy is used to drive the turbine.	Remember	CO 1	CLO1	AEEB14.01
2	Hydroelectric power plant is?	Hydroelectric power plants are conventional source of energy. About 16.6% of total electricity and about 70% of total renewable energy of world is provided by hydroelectric power plants. They are not Non-renewable because water is inexhaustible. It is not continuous source of energy because its output fluctuates with change in flow rate of water with season.	Remember	CO 1	CLO2	AEEB14.02
3	Why Hydroelectric power plant is generally located near load centre.	Hydroelectric power plants are generally constructed in hilly areas. These power plants are quite away from the load centre.	Remember	CO 1	CLO5	AEEB14.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
4	Hydroelectric power plant is mainly located in?	In order to get sufficient head, hydroelectric power plants are constructed in hilly areas. In desert and flat areas sufficient water head cannot be obtained. Deltas are not suitable for this because of high sedimentation.	Remember	CO 1	CLO6	AEEB14.06
5	Which element of hydroelectric power plant prevents the penstock from water hammer phenomenon?	Sudden increase in water pressure in penstock due to closing of gates is called water hammer. Surge tank is a tank at sufficient height, connected to penstock through riser pipe. It takes the rejected water and relieves the penstock from excessive water hammer pressure.	Remember	CO 1	CLO8	AEEB14.08
6	Dam having very wide base as compared to its height is called?	Buttress dams are the concrete dams supported on downstream side by buttresses. Arc dams are concrete dams curved from upstream side. Earth dam is a type of embankment dam and have rock filled inside the structure.	Remember	CO 1	CLO9	AEEB14.09
7	Trash racks are built for?	Heavy solid materials flowing with water can damage the turbine blades if not stopped. Trash racks are closely spaced flat bars which provides narrow path from which such unwanted materials cannot pass.	Remember	CO 1	CLO4	AEEB14.04
8	Penstock in a hydroelectric power plant is?	Penstocks are the conduit built of steel or reinforced concrete. Penstock connects forebay or surge tank to scroll case of turbine. Their main function is to carry water from dam to the turbine.	Remember	CO 1	CLO5	AEEB14.05
9	The pressure at the inlet or exit of the draft tube should not be?	Decrease in pressure in any portion of turbine below one third of atmospheric pressure may cause vapour bubbles or cavities to form. This phenomenon is called cavitation. Also to maintain continuity of flow without vaporisation the pressure should not fall below vapour pressure of water.	Remember	CO 1	CLO8	AEEB14.08
10	Trash racks are located in?	Intake includes headworks at the entrance of conduit. Those headworks include different structures, trash racks are one of them. Trash racks are fitted directly at the intake to prevent the floating and other materials from going into the conduit.	Remember	CO 1	CLO3	AEEB14.03
11	Kaplan turbine is ?	In Kaplan turbine water strikes the turbine blades axially. That's why Kaplan turbine is an axial	Remember	CO 1	CLO4	AEEB14.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		flow turbine. Kaplan turbines are special type of turbines for low head applications.				
12	Pelton turbines are used for?	Pelton turbines are impulse turbines and are suitable for high head low flow plants. Pelton turbines consist of elliptical shaped buckets along its Periphery. Water is released from nozzle to the buckets of turbine.	Understand	CO 1	CLO6	AEEB14.06
13	Francis turbines are the type of?	Francis turbines are inward mixed flow type reaction turbines. Such turbines develop power partly due to velocity of water and partly due to difference in pressure acting on the front and back of the runner blades.	Remember	CO 1	CLO2	AEEB14.02
14	Operating head of Francis turbine is?	Francis turbines are medium head(30 to 200 m) and medium flow turbines. Using it for low or high head will cause inefficient operation. Their life is about decades so maintenance cost is low.	Remember	CO 1	CLO8	AEEB14.08
15	Which of the following is not a reaction turbine?	When the entire pressure of water is converted into kinetic energy in a nozzle and the jet thus formed drives the wheel then the turbine is called impulse turbine. Pelton turbine works in similar way, so it is an impulse turbine. Francis, Kaplan and propeller turbines are reaction turbines.	Remember	CO 1	CLO6	AEEB14.06

UNIT – II
HYDROELECTRIC POWER STATIONS

1	Inside pressure of which of turbine is equal to atmospheric pressure?	Francis and propeller turbines are totally submerged in water, the turbine casing is full of water. As the water flows through the turbine blades, its pressure changes. Also the discharging water creates negative pressure below the turbine blades. Pelton turbines are fitted in open air and water Jet is forced into its blades by nozzle so it's inside pressure is equal to atmospheric pressure.	Remember	CO 2	CLO3	AEEB14.03
2	Which turbine has highest speed?	Francis turbine has a specific speed of 60 to 300 rpm. Specific speed of Pelton turbine is lowest. Speed of Kaplan turbine is 2 to 3 times more than that of Francis turbine.	Understand	CO 2	CLO5	AEEB14.05
3	Governing mechanism used in case of Pelton wheel turbine is?	During load variation it is necessary to maintain the speed of the alternator constant. This is achieved by controlling the flow of water entering the turbine by	Remember	CO 2	CLO1	AEEB14.01

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		the help of automatic adjustment of guide vanes for reaction turbine and the nozzle needle is in case of impulse turbine. Such an operation of speed regulation called governing and the system used to do this is called governor.				
4	What Is The Significance Of Dam?	<ul style="list-style-type: none"> ○ Dam performs the following two basic functions. ○ It develops a reservoir of the desired capacity to store water. ○ It builds up the head for power generation. 	Remember	CO 2	CLO2	AEEB14.02
5	What Are Hydrograph And Its Significance?	Hydrograph is a graphical representation between the discharge or flow with time. It is plotted with flow as ordinates (Y-axis) and time intervals as abscissas (X-axis). The ordinates may be plotted in terms of the gauge height, the number of cubic meters per second per square kilometer, the power in kW that can be developed. The abscissas may be taken in terms of hours, days, weeks or months. It also indicates the power available from the stream at different times of the day or year (particular period). Hydrograph is similar to load curve and used to study the electric power.	Remember	CO 2	CLO4	AEEB14.04
6	What Is The Use Of Spillway?	When the water level in the reservoir basin rises, the stability of the dam structure is endangered. To relieve the reservoir of this excess water, a structure is provided in the body of the dam. This structure is called spillway. This is constructed to act as safety value. This provides structural stability of the dam under conditions of the floods without raising the reservoir level above High Flood Level.	Remember	CO 2	CLO8	AEEB14.08
7	What Is Mass Curve?	Mass curve indicates the total volume of run-off in m ³ up to certain time. The abscissa may be day, month or year. This curve is obtained from the records of average monthly flow. The slope of curve at any point gives the rate of flow at that time. These	Understand	CO 2	CLO6	AEEB14.06

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		curves are used to determine the capacity of the storage reservoirs for hydro projects.				
8	What Is Called Hydro Electric Power Station?	The power station, in which the kinetic energy of water is converted into electrical energy, is called hydro-electric power station.	Remember	CO 2	CLO8	AEEB14.08
9	What Is The Source Of Generation In The Hydroelectric Power Station?	Water.	Remember	CO 2	CLO9	AEEB14.09
10	What Are The Different Sections Of A Hydroelectric Power Station?	The different sections of a hydroelectric power station are dams, spillways, gates, penstock & hydroelectric generators.	Understand	CO 2	CLO7	AEEB14.07
11	What Is The Function Of The Dam In A Hydroelectric Power Station?	The function of dam is to create required water head and store water in catchment area.	Understand	CO 2	CLO5	AEEB14.05
12	Where Is Water Stored?	Water is stored in the reservoir of the catchment area.	Remember	CO 2	CLO6	AEEB14.06
13	What Is The Water Turbine?	Water turbine is a prime mover used for the alternator at the hydro electric power plant which changes the direction of the flowing water and converts the same to useful mechanical energy and also gives mechanical energy to the alternator.	Understand	CO 2	CLO1	AEEB14.01
14	What Are The Types Of Water Turbines Used In A Hydroelectric Power Plant?	Impulse turbine, Reaction turbine.	Understand	CO 2	CLO2	AEEB14.02
15	What Is The Method Of Selection Of Water Turbines?	Impulse turbine is selected for very high heads and a small quantity of water as it utilizes the kinetic energy of water. Reaction turbine is selected for low and medium head and the large quantity of water as it utilizes the pressure of the water.	Understand	CO 2	CLO5	AEEB14.05
MODULE-III						
1	How Does A Residential Solar Electric System Work?	Solar cells in the modules mounted on your roof convert sunlight directly into DC power. A component called an inverter converts this DC power into AC power that can be used in your home. The system is interconnected with your utility. During the day, if your solar system produces more electricity than your home is using, your	Remember	CO 3	CLO4	AEEB14.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		utility may allow net metering or the crediting of your utility account for the excess power generated being returned to the grid. Your utility would provide power as usual at night and during the day when your electricity demand exceeds that produced by your solar system. Systems are also available with a battery backup. Part of the power produced by your solar system during the day is used to charge the batteries, which provide power for your critical loads in the event of a power outage.				
2	Will My System Work At Night?	No. Sunlight must be present for your solar modules to produce power. At night, you draw power from your utility.	Remember	CO 3	CLO2	AEEB14.02
3	Will My System Work On Cloudy Days?	Yes, though they produce less electricity. Under a light overcast sky, panels might produce about half as much as under full sun.	Remember	CO 3	CLO3	AEEB14.03
4	What is the rate of solar energy reaching the earth surface?	The solar energy reaching the surface of the earth is about 1016W whereas the worldwide power demand is 1013W. That means solar energy gives us 1000 times more energy than our requirement.	Remember	CO 3	CLO5	AEEB14.05
5	What is total amount of solar energy received by earth and atmosphere?	Even if we use 5% of this energy, it is more than 50 times our requirement. The total solar radiation absorbed by the earth and its atmosphere is 3.8×10^{24} Joules/year. Except that it is distributed over the area of earth.	Remember	CO 3	CLO8	AEEB14.08
6	Which is most common source of energy from which electricity is produced?	Coal is the most common source of energy that is being used since industrialization. Modern steam boilers can burn coal in any of its form as a primary fuel. Different ranks of coal available are peat, lignite, bituminous and anthracite.	Remember	CO 3	CLO9	AEEB14.09
7	Oil is estimated to last for _____ more.	Almost 40% of energy needs is met by oil alone. With present consumption and a resource of 250,000 million tonnes of oil, it is estimated to be last for only 100 years, unless more oil is discovered. Major chunk of oil comes from petroleum.	Remember	CO 3	CLO1	AEEB14.01
8	Complete the following reaction. $\text{H}_2\text{O} + \text{CO}_2 \rightarrow$ _____	$\text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{CH}_2\text{O} + \text{O}_2$:under solar energy CH_2O is stable at low temperature but breaks at higher temperature releasing heat equal to 469 Kj/mole.	Understand	CO 3	CLO6	AEEB14.06

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9	In what form is solar energy is radiated from the sun?	Solar energy is radiated from the sun in the form of electromagnetic waves of shorter wavelength of 0.2 to 0.4 micrometers. Out of all the solar energy radiations reaching the earth's atmosphere, 8% is ultraviolet radiation, 40% is visible range light and 46% is by infrared radiation.	Remember	CO 3	CLO9	AEEB14.09
10	What does MHD stands for in the energy field?	Magneto hydro dynamic is a generator which is used for direct conversion of thermal energy into electrical energy. They work on faraday principle. When an electric conductor moves across a magnetic field, electric current is produced.	Remember	CO 3	CLO4	AEEB14.04
11	Solar radiation which reaches the surface without scattering or absorbed is called _____	Solar radiation that has not been absorbed or scattered and reaches the ground from the sun is called direct radiation or beam radiation. It is the radiation which produces a shadow when interrupted by an opaque object.	Understand	CO 3	CLO6	AEEB14.06
12	The scattered solar radiation is called _____	Diffuse radiation received from the sun after its direction has been changed by reflection and scattering by the atmosphere. Since the solar radiation is scattered in all direction in the atmosphere, diffuse radiation comes to the earth from all parts of the sky.	Understand	CO 3	CLO2	AEEB14.02
13	Solar radiation received at any point of earth is called?	Insolation is the total solar radiation received at any point on any point on the earth's surface. In other words insolation is the sum of the direct and diffuse radiation. More specifically insolation is defined as the total solar radiation energy received on a horizontal surface of unit area on the ground in unit time.	Remember	CO 3	CLO7	AEEB14.07
14	Why Insolation is less?	The insolation at a given point or location on the earth's surface depends among other factors, on the altitude of the sun in the sky. As a result of absorption and scattering, the insolation is less when the sun is low in the sky than when it is higher.	Understand	CO 3	CLO9	AEEB14.09

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15	HHW stands for ?	These are generated in reprocessing of spent fuel. They contain all fission products and contain of the transuranium elements not separated during reprocessing. Such wastes are to be disposed of carefully.	Understand	CO 3	CLO6	AEEB14.06
UNIT – IV WIND ENERGY						
1	Why blade velocity of wind turbine varies?	Wind turbine experiences change in velocity dependent upon the blade inlet angle and the blade velocity. Since the blades are long, the blade velocity varies with the radius to a greater degree than steam or gas-turbine blades and the blades are therefore twisted.	Remember	CO 4	CLO6	AEEB14.06
2	When was the Halladay wind mill introduced?	Invented by Daniel Halladay in 1854, the Halladay Standard was the first commercially successful self-governing windmill in 1854 was the firms of Halladay, McCray & Co., Ellington, Conn. Partners in the company were inventor Daniel Halladay, John Burnham and Henry McCray.	Remember	CO 4	CLO8	AEEB14.08
3	How much ideal efficiency should practical turbine have?	As wind turbine wheel cannot be completely closed, and because of spillage and other effects, practical turbines have 50 to 70% of the ideal efficiency. The real efficiency η is the product of this and η_{max} and is the ratio of an actual to total power. $P = \eta P_{tot}$.	Remember	CO 4	CLO2	AEEB14.02
4	How many types are acting on propeller type wind mill?	There are two types of forces operating on the blades of a propeller type wind turbine. They are the circumferential forces in the direction of wheel rotation that provide the torque and the axial forces in the direction of the wind stream that provide an axial thrust that must be counteracted by proper mechanical design.	Remember	CO 4	CLO5	AEEB14.05
5	Calculate the air density, when 10m/s wind is at 1std atmospheric pressure and 15°C?	For air, gas constant $R = 287$ J/kgK, 1atm = 1.01325 X 10 ⁵ Pa Air density, $\rho = P/RT = (1.01325 \times 10^5)/(287(15+273.15)) = 1.226$ kg/m ³ .	Remember	CO 4	CLO1	AEEB14.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
6	Calculate the air density, when 10m/s wind is at 1std atmospheric pressure and 15°C?	For air, gas constant $R = 287$ J/kgK, $1\text{atm} = 1.01325 \times 10^5$ Pa Air density, $\rho = P/RT = (1.01325 \times 10^5)/(287(15+273.15)) = 1.226$ kg/m ³ .	Remember	CO 4	CLO1	AEEB14.01
7	Calculate the air density when 18m/s wind is at 1std atmospheric pressure and 34°C?	For air, gas constant $R = 287$ J/kgK, $1\text{atm} = 1.01325 \times 10^5$ Pa Air density, $\rho = P/RT = (1.01325 \times 10^5)/(287(34+273.15)) = 1.149$ kg/m ³	Remember	CO 4	CLO3	AEEB14.03
8	What is the total power produced if the turbine diameter is 120m?	Total power P, $P = 0.245 \times (\pi D^2/4)$ $= 0.245 \times (\pi (120)^2/4)$ $= 0.277$ KW.	Remember	CO 4	CLO9	AEEB14.09
9	What is the total power produced if the turbine diameter is 90m?	Total power P, $P = 0.245 \times (\pi D^2/4)$ $= 0.245 \times (\pi (90)^2/4)$ $= 0.155$ KW.	Remember	CO 4	CLO5	AEEB14.05
10	Which type of windmill blades are made out of sheet metal or aluminum?	Horizontal axis multi blade windmill is made from sheet metal or aluminum. The rotors have high strength to weight ratios. They have good power coefficient, high starting torque and added advantages of simplicity and low cost.	Understand	CO 4	CLO2	AEEB14.02
11	Which type of wind mills blade are made out of cloth?	The blade surface of sail type wind mill is made of cloth, nylon or plastics arranged as mast and pole or sail wings. There is also variation in the number of sails used. Sails are found in different designs, from primitive common sails to the advances patent sails.	Remember	CO 4	CLO6	AEEB14.06
12	Which type of windmill has better performance?	The horizontal axis mills generally have netter performance. They have been used for various applications including electric power generation, and pumping water. The latter introduces some complexity into the design as the mechanical energy has to be transmitted over a distance.	Understand	CO 4	CLO3	AEEB14.03
13	What does TSR stand for in design consideration of wind mills?	The tip speed ratio, X, or TSR for wind turbines is the ratio between the tangential speed of the tip of a blade and the actual speed of the wind. The tip speed ratio is related to efficiency, with	Remember	CO 4	CLO5	AEEB14.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the optimum varying with blade design.				
14	With upto how many propellers can windmills are built?	Wind turbines have been built with upto six propellers type blades but two and three bladed propellers are most common. A one bladed rotor with a balancing counter weight has some advantages, including lower weight and cost and simpler controls, over the multi-bladed type.	Understand	CO 4	CLO7	AEEB14.07
15	Turbines with how many propellers are used in order to avoid vibrations?	Turbines with three blades are used to avoid vibrations that occur due to the turning or yawing of the rotor in order to face in into the wind. However, this problem can be overcome by controlling the yaw rate.	Remember	CO 4	CLO2	AEEB14.02
1	What is the advantage of sectionalizing of power plant?	Sectionalizing means installing more number of small units rather than installing a big unit. Doing so enables us to maintain continuity of supply from rest of the units, when one or two units of plant fails. this makes the plant more reliable.	Remember	CO 5	CLO7	AEEB14.07
2	The area under the load curve represents?	Load curve is obtained by plotting fluctuating load by keeping load on y axis and time in x axis. The area under the load curve represents the total number of units generated in a particular time.	Remember	CO 5	CLO9	AEEB14.09
3	Load duration curve indicates?	The variation of load during different hours of the day is shown by load curve. Load duration curve is different from Load curve. Load duration curve indicates the variation of the load, but with the load arranged in descending order of magnitude. Load duration curve give the number of hours for which a particular load lasts during a day.	Understand	CO 5	CLO8	AEEB14.08
4	During which time the demand of electrical energy is maximum?	From the load curve it is obtained that during early morning demand is always low. Around 5 A.M. it starts increasing and around 9 A.M. load reaches a high value and remains almost constant till evening except for some Dip during lunch hours. The load again starts increasing	Remember	CO 5	CLO6	AEEB14.06

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		in evening hours and reaches its peak around 7 to 9 P.M.				
5	Size and cost of installation depends upon?	The greatest of all “short time interval averaged” during a given period, on the power system is called the maximum demand. Maximum demand represents the maximum amount of load that is active, out of total connected load. So the size and rating of power plant depends on Maximum demand.	Remember	CO 5	CLO2	AEEB14.02
6	What is Demand factor?	Demand factor is the ratio of actual maximum demand on the system to the total load connected to the system. The idea of demand factor was introduced due to the fact that all the equipments connected to the system does not work at a time in practice.	Remember	CO 5	CLO3	AEEB14.03
7	The load factor is?	Load factor is the ratio of average demand to the maximum demand. Average demand can not be greater than maximum demand. So the value of load factor is always less than unity.	Remember	CO 5	CLO4	AEEB14.04
8	In practice what is the value of diversity factor?	Maximum demand of different consumers never occurs at a time, due to this the total maximum demand of the load is always less than sum of individual maximum demands. And hence, demand factor e.i. the ratio of sum of individual maximum demand to the maximum demand of total load is always greater than unity.	Remember	CO 5	CLO5	AEEB14.05
9	Which power plant has minimum operating cost?	Hydroelectric power plant has lowest running cost because it does not needs any fuel and can be operated by few number of persons. Nuclear gas and thermal power plant requires fuels also the handling cost of fuels is added with the total cost.	Remember	CO 5	CLO6	AEEB14.06
10	Plants with higher operating cost and greater flexibility are suitable for?	Plants which can meet sudden variation of load demand are said to have higher flexibility. Plants with higher operating cost can't be used as base load plants. Plants with such capabilities are most suitable for peak load plants as they can respond immediately.	Remember	CO 5	CLO8	AEEB14.08
11	Plants with maximum operating costs are put on load for?	Power plants with minimum operating cost are put on load for maximum time. Plants with medium operating cost are only loaded when required by the load demand on the system. Plants	Remember	CO 5	CLO4	AEEB14.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		with maximum operating cost are kept in reserve and would operate only in emergency.				
12	What is the result of the product of diversity factor and maximum demand?	Sum of consumers maximum demand	Remember	CO 5	CLO7	AEEB14.01
13	What is the value of demand factor?	Less than unity.	Remember	CO 5	CLO8	AEEB14.08
14	What is connected load?	Installed electrical load in the premises of the consumer.	Understand	CO 5	CLO9	AEEB14.09
15	On which one of the following cycles does a modern steam power plant work?	The Rankine cycle is a model that is used to predict the performance of steam turbine systems. The Rankine cycle is an idealized thermodynamic cycle of a heat engine that converts heat into mechanical work. The heat is supplied externally to a closed loop, which usually uses water as the working fluid.	Understand	CO 5	CLO6	AEEB14.06

Signature of the Faculty

HOD, EEE

