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Power Systems Interview Questions

Q1. What is a Power System?

The **Power system** is a network which consists of the components used in generation, distribution and transmission systems. The power system is used to produce electrical energy from coal and diesel. It has devices that are connected to the system like motor, circuit breaker, synchronous generator, transformer, conductor, etc.

Q2. What are P-V curves?

In the P-V curve, P stands for **Pressure** and V stands for **Volume**. P-V curve or indicator diagram represent the corresponding change in pressure and volume in a system. This curve is very useful in many processes like cardiovascular physiology, thermodynamics and respiratory physiology. P-V curve designed in the 18th century to understand the efficiency of the engine.

Q3. What is synchronous condenser?

Synchronous Condenser, referred to Synchronous Phase modifier or Synchronous compensator, is an advanced technique of enhancing power factor. This is a type of motor that runs without using a mechanical load. By varying the excitation of its field winding, Synchronous condenser can absorb or produce the reactive volt-ampere.

It is great to use a synchronous condenser for power factor improvement higher than 500 kVAR whereas a static capacitor bank is used for lower-rated systems.

Q4. What is difference between fuse and circuit breaker?

The differences are:

Fuse

A fuse is a wire which prevents the circuit from overheating.

It doesn't indicate overload.

It can be used only once.

It gives protection against power overloads.

Circuit Breaker

Circuit breaker is an automated switch that prevent the circuit from the overload

It indicates overloads.

It can be used for a number of times.

It gives protection not only power overloads but also short circuits.

It performs detection and interrupts faulty circuit conditions.	It does not detect the faulty circuit conditions. It only performs the interruption process.
It possesses low breaking capacity.	It possesses high breaking capacity in comparison with the fuse.
It is automatically operated.	Circuit breaker can either be automatic or manually operated.
It takes very low time to operate which is approx. 0.002 seconds	It takes 0.02 – 0.05 seconds to operate.
It is cheaper as compared to Circuit breaker.	It is costly.

Q5. What is tariff?

Tariff term is described for the tax imposed on the products imported from the foreign countries to make it costly. As a result, the products cost increase and become less desirable or less competitive versus domestic goods and services. The cause of implanting Tariff is to restrict the trade from specific foreign countries or minimize the importation of a particular good.

There are two types of tariff imposed by Government: -

- Specific Tariff
- Ad-valorem Tariff

Q6. What is Transmission and distribution line?

Transmission lines are used for large distances and they have higher voltage so that they can transport more electricity. In other words, the transmission line carries the electricity from power plants to substations.

Distribution lines are used to transport electricity for a short distance. As the voltage is lower, they can transport electricity locally. It carries the electricity to the homes from the substation.

Q7. Enlist different sources of energy?

There are mainly two types of source of energy which are further divided:

1. **Renewal Source of energy** – The sources of energy come from the natural source that is replenished constantly. Types of renewal sources are:
 1. Solar energy
 2. Wind energy
 3. Geothermal energy
 4. Water energy
 5. Biomass and Biofuel
2. **Non-renewal Source of energy** – The energy derived from the sources that will not be replenished and will ultimately run out. Some non-renewal sources are:
 1. Coal

2. Oil
3. Natural gas
4. Petroleum

Q8. What is a Relay?

Relay is the switches that perform the closing and opening of the circuit. They perform this function electronically as well as electromechanically. Relay is used in a number of applications like manufacturing, control panels and building automation to control the power.

Types of Relay: There is a wide variety of relay which are differentiated on the basis of working principles, operation and polarity:

- Electrothermal Relay
- Electromechanical Relay
- Solid State Relay
- Hybrid Relay
- Electromagnetic relay

Q9. What is nuclear power plant?

Nuclear Power plant is used to generate electricity from nuclear fission. The heat is generated with the help of nuclear reactors and Rankine cycle (convert the water into steam). This steam is further used to spin the turbine and generator. Nuclear power provides 11 per cent of the total electricity produced in the world. .

Below mentioned is the list of the components that are used in nuclear power plants to generate the electricity.

- Nuclear Reactor
- Steam Generation
- Turbine and Generator
- Cooling Towers

Q10. What do you mean by grading of cables?

The process of obtaining a uniform distribution of dielectric stress or voltage gradient in a dielectric is called grading of cable. The dielectric stress is minimum at the outermost sheath of the conductor whereas it is maximum at the surface. This non-uniform distribution of the stress causes insulation to break down and increases the thickness of the cable. So, to avoid this, the uniform distribution of dielectric stress is achieved with the grading of cables.

Q11. What are pumped storage plant?

Pumped-storage hydroelectricity is also referred to as pumped hydroelectric energy storage is a type of hydroelectric energy storage which is used for load balancing. When there is a high demand for electric power, water from the reservoir is released through turbines to generate electric power. It has the largest capacity of storage available for the grid.

Q12. How do you verify CT circuits?

A CT ratio test can be performed by injecting a primary current and measuring the current output, or by injecting a secondary voltage and measuring the induced primary voltage.

Q13. What is expanded ACSR?

ACSR stands for **Aluminum conductor steel-reinforced** cable.

Q14. Explain what is Ferranti effect?

Ferranti effect is a phenomenon that describes the voltage increase at the receiver of a transmission line compared to the voltage at the sending end. It can be seen when either the load is very small or no load is connected.

Q15. What are the internal and external faults?

Internal Faults : Internal faults are phase to phase fault and it causes the system component failure. Internal faults can occur due to winding failure and overheating. If the cooling system fails then it can also cause the mechanical fault. Testing and maintenance is the best way to avoid internal faults.

External fault: An external fault occurs outside the system or transformer. It does not involve hardware failure. External problems like lightning strikes can cause damage. Even if the air temperature exceeds a threshold value, it is a fault. As these things are not predictable, it can only be solved after the causing condition no longer exists. So, it is important to prepare for these kinds of situations. External faults are minor but it can lead to system failure if the problem is not resolved.

Q16. What is Electrical Grounding and Earthing?

Earthing: Earthing is used to protect against the unwarranted spikes and bouts of electricity as these are a threat to life. Earthing is done by installing an earth wire from the device to the ground. Earth wire is used to provide a very low resistance path for the flow of current to ground. By this, a person will not get the shock.

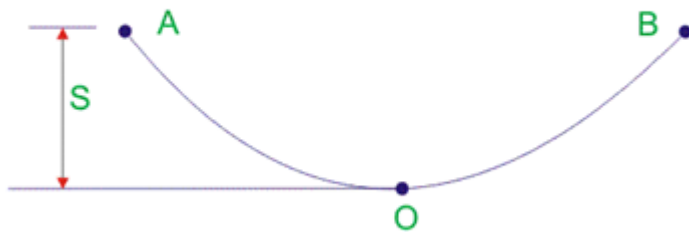
Grounding: With the help of Grounding, insulation against accidental currents is obtained. The main wire is connected to the power supply and another part of the wire is under the bed. It avoids overloading and other dangerous effects.

Q17. What do you understand by Sag?

Sag means to sink or bend downward by weight or pressure.

Q18. How does the over voltage surge affect the power system?

Sag is defined as the difference in the level between the lowest point of the conductor and the highest point of supports (tower or pole) where the conductor is attached. It is mentioned in the given figure by point S.



Sag is very important for safety purposes. For the better quality and continuity of electrical service, sag needs to be analyzed.

Q19. What is Bus Bar Protection?

Bus Bar protection as the name suggests is used to protect the busbar from any default. In case of fault occur on the bus bar, all the supply is disturbed and the feeders are disconnected. There are many reasons for the fault, like the failure of circuit breakers, failure of support insulators and foreign object accidentally falling across the bus bar. Followings are the most used schemes for bus zone protection: -

- Backup protection
- Differential Overcurrent Protection
- Circulating current protection
- Voltage Overvoltage Protection

- Frame leakage protection

Q20. What are major effects of Electrical Faults?

The various effect of faults in the power system are:

- Overheating and mechanical stress can be caused due to the heat generated from the high amount of the fault.
- Due to the arcing caused by heavy currents, there is always a danger of fire. If the fault remains for a longer time the fire may spread to the component of the system.
- Overheating also weakens the insulation and can lead to reducing the life of insulation.
- The unbalanced current and voltage can cause the heating of rotating machines connected to the system.
- All the generators are interconnected with each other so it is necessary to synchronize. Unbalancing of the current and the voltage can shut down the entire system and in a worse situation, it may lead to a blackout.
- It can also reduce the reliability of the system because of interruption in the supply to the consumers
- In addition to this, fault can also damage the equipment used in the power system network.

So, to avoid the above problem it is important to replace the faulty part from the system.

Q21. What is a bundle conductor?

Two or more sub-conductor together form a bundle conductor. It works as one phase conductor. One phase can be made of one, two, three or four sub conductors. **Bundle conductor** is used for voltages which are greater than 22 kV

The main purpose of the bundle conductor is the transmission. It maintains voltage and enhances efficiency by reducing the inductance and skin effect.

Q22. What is Critical disruptive Voltage?

It is defined as the minimum voltage at which corona discharge started to occur. In other words, the voltage at which breakdown of the dielectric strength of air occurs. It is signified by

V_d

->D represents the distance between two conductors; r is the radius of each conductor; So, the maximum gradient is at the surface is

$$g_{max} = \frac{V_d}{r \ln\left(\frac{D}{r}\right)}$$

And the critical disruptive voltage is calculated by :

$$V_d = r g_{max} \ln \left(\frac{D}{r} \right)$$

Q23. What are the various states of operation in power system?

The various states are:

1. **Normal state:**

If both operating constraints and load are satisfied it means the system is normal. The total demand on the system in the normal state is met by satisfying all the operating constraints.

2. **Alert state:**

The system is in an alert state if the level of the security of the system falls below a certain level or the disturbance of the system increases.

3. **Emergency state:**

If the disturbance is severe in an alert state, the system will push into the emergency state. With corrective action, the system will return either to a normal state or in an alert state.

4. **Extremis state:**

During the emergency state, if no preventive action takes place then it goes to either extremis state. In this case, the control action has taken place to bring the system back to either the normal state or the emergency state.

Q24. What is Slack Bus?

In electric power, A **slack bus** is also known as a **swing bus** and is defined by V? bus. In a system, Slack bus is used to maintain the balance the active power |P| and reactive power |Q| during the load flow studies. It either emits or absorbs the active or reactive power to and from the system.

Q25. When Directional relays are used?

When the flow of power in the transmission line is in a specific direction, the direction relay is used.

Q26. How many relays are required in order to protect a device effectively?

For better protection, a two-phase fault relay and one earth fault relay is required.

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