1. What is impulse staging in steam turbines?

a) It refers to the arrangement of multiple impulse stages in series
b) It involves the use of both impulse and reaction stages
c) It is a method of increasing the turbine's efficiency by reducing pressure in stages
d) It describes the process of controlling the rate of steam flow into the turbine

Answer: b) It involves the use of both impulse and reaction stages

Explanation: Impulse staging in steam turbines involves alternating rows of fixed nozzles (to convert steam pressure into velocity) and moving blades (to extract energy from the high-velocity steam). This method combines both impulse and reaction principles for efficient energy conversion.

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2. What is the purpose of velocity and pressure compounding in steam turbines?

a) To increase the speed of the steam flow
b) To decrease the axial thrust exerted by the turbine
c) To maintain a constant velocity of steam throughout the turbine
d) To extract energy from the steam efficiently by gradually converting pressure into velocity

Answer: d) To extract energy from the steam efficiently by gradually converting pressure into velocity

Explanation: Velocity and pressure compounding involves gradually converting the pressure of the steam into velocity while maintaining a relatively constant velocity throughout the turbine. This allows for efficient energy extraction from the steam.

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3. What is the utilization factor in steam turbine analysis?

a) It represents the efficiency of converting steam energy into mechanical work
b) It indicates the proportion of steam energy utilized by the turbine
c) It measures the effectiveness of steam utilization in the condenser
d) It quantifies the pressure drop across each turbine stage

Answer: b) It indicates the proportion of steam energy utilized by the turbine

Explanation: The utilization factor in steam turbine analysis refers to the proportion of the total available energy in the steam that is effectively utilized by the turbine to perform mechanical work.

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4. How is the optimum utilization factor determined for Curtis stage turbines?

a) By maximizing the stage efficiency
b) By minimizing blade and nozzle losses
c) By optimizing the steam pressure and temperature
d) By adjusting the speed ratio of the turbine

Answer: a) By maximizing the stage efficiency

Explanation: The optimum utilization factor for Curtis stage turbines is achieved by maximizing the stage efficiency, which involves minimizing losses and optimizing the design parameters to extract the maximum amount of energy from the steam.

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5. In Rateau stage turbines, what is the qualitative effect of blade and nozzle losses on vane efficiency?

a) Decreases vane efficiency
b) Increases vane efficiency
c) No effect on vane efficiency
d) Improves overall turbine efficiency

Answer: a) Decreases vane efficiency

Explanation: Blade and nozzle losses in Rateau stage turbines result in decreased vane efficiency, as these losses represent energy dissipated in the form of heat or turbulence rather than being effectively converted into mechanical work by the turbine blades.

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6. What are Parson’s stages in steam turbines?

a) They are impulse stages used in early turbine designs
b) They are reaction stages designed for high-pressure steam conditions
c) They represent a type of velocity-compounded turbine
d) They refer to the combination of impulse and reaction stages

Answer: b) They are reaction stages designed for high-pressure steam conditions

Explanation: Parson's stages in steam turbines are reaction stages specifically designed to operate efficiently under high-pressure steam conditions, utilizing the principle of pressure drop across the moving blades to extract energy from the steam.

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7. What does the degree of reaction indicate in steam turbines?

a) The extent to which steam pressure is converted into velocity
b) The proportion of total energy extracted by the moving blades
c) The efficiency of the stator blades in redirecting steam flow
d) The balance between pressure drop and velocity increase across the turbine stages

Answer: b) The proportion of total energy extracted by the moving blades

Explanation: The degree of reaction in steam turbines indicates the proportion of the total energy extracted by the moving blades compared to the total energy available in the steam. It reflects the turbine's design and the division of work between the fixed and moving blades.

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8. What is the velocity coefficient in steam turbine analysis?

a) It quantifies the speed of the steam at the turbine inlet
b) It represents the ratio of actual steam velocity to ideal velocity
c) It measures the efficiency of the nozzle in converting pressure into velocity
d) It indicates the degree of steam expansion within the turbine

Answer: b) It represents the ratio of actual steam velocity to ideal velocity

Explanation: The velocity coefficient in steam turbine analysis is a dimensionless parameter that compares the actual velocity of the steam at a specific point in the turbine to the ideal velocity calculated based on thermodynamic principles.

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9. How is stage efficiency calculated in steam turbines?

a) By dividing the enthalpy drop across the stage by the ideal enthalpy drop
b) By comparing the actual work output of the stage to the theoretical work output
c) By quantifying the pressure drop across the stage
d) By analyzing the degree of reaction within the stage

Answer: b) By comparing the actual work output of the stage to the theoretical work output

Explanation: Stage efficiency in steam turbines is calculated by comparing the actual work output of the stage (measured in terms of mechanical work or energy extracted) to the theoretical work output calculated based on the thermodynamic properties of the steam.

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10. What conditions are required for optimum efficiency in steam turbines?

a) High steam pressure and low turbine speed
b) Low steam pressure and high turbine speed
c) Balanced pressure and velocity compounding
d) Minimal losses and efficient steam expansion

Answer: d) Minimal losses and efficient steam expansion

Explanation: Optimum efficiency in steam turbines is achieved when there are minimal losses (such as friction and leakage) and efficient steam expansion across the stages, maximizing the conversion of steam energy into mechanical work.

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11. What is the significance of axial thrust in steam turbines?

a) It indicates the efficiency of energy conversion within the turbine
b) It represents the axial movement of the rotor due to steam pressure imbalances
c) It measures the rotational speed of the turbine shaft

d) It quantifies the rate of steam flow through the turbine

Answer: b) It represents the axial movement of the rotor due to steam pressure imbalances

Explanation: Axial thrust in steam turbines refers to the force exerted along the axis of the rotor due to pressure differences across the turbine stages. It can cause axial movement of the rotor and needs to be carefully managed to prevent mechanical issues.

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12. What is the purpose of the reheat factor in steam turbines?

a) To increase the overall temperature of the steam entering the turbine
b) To reduce the moisture content of the steam before entering the turbine
c) To improve the efficiency of the turbine by reheating the steam between stages
d) To decrease the pressure drop across the turbine stages

Answer: c) To improve the efficiency of the turbine by reheating the steam between stages

Explanation: The reheat factor in steam turbines involves reheating the steam between turbine stages to maintain its temperature and prevent condensation. This helps improve the efficiency of the turbine by ensuring that steam expands more effectively across each stage.

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13. What are the two types of flow associated with reactions staging in steam turbines?

a) Laminar and turbulent flow
b) Free vortex and forced vortex flow
c) Subsonic and supersonic flow
d) Axial flow and radial flow

Answer: b) Free vortex and forced vortex flow

Explanation: Reactions staging in steam turbines can exhibit two types of flow: free vortex flow, where the steam expands freely in a radial direction, and forced vortex flow, where the steam is directed to flow in a specific direction by the turbine blades.

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14. What are the governing characteristics of steam turbines?

a) They regulate the steam pressure entering the turbine
b) They control the rotational speed of the turbine shaft
c) They adjust the degree of reaction within the turbine stages
d) They optimize the utilization factor of the turbine

Answer: b) They control the rotational speed of the turbine shaft

Explanation: The governing characteristics of steam turbines involve mechanisms to control the rotational speed of the turbine shaft, typically through adjusting steam flow or controlling steam inlet conditions, to maintain stable operation under varying load conditions.

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15. What factors determine the performance characteristics of steam turbines?

a) Steam pressure and temperature only
b) Blade design and nozzle efficiency
c) Speed ratio and axial thrust
d) Steam properties, turbine design, and operating conditions

Answer: d) Steam properties, turbine design, and operating conditions

Explanation: The performance characteristics of steam turbines are influenced by various factors including the properties of the steam (pressure, temperature, quality), turbine design (blade geometry, stage arrangement), and operating conditions (load, speed, efficiency). These factors collectively determine the efficiency and effectiveness of the turbine.

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