



MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.



MUST KNOW CONCEPTS

MKC

EEE

2021 - 22


Course Code & Course Name : **19GES20 & Renewable Energy Sources**
Year/Sem/Sec : **II / III**

| Course code & Name | | 19GES20 & Renewable Energy Sources | | |
|----------------------------|------------------------------|------------------------------------|--|-------|
| S. No | Term | Notation (Symbol) | Concept/Definition/Meaning/Units/Equation/Expression | Units |
| UNIT I INTRODUCTION | | | | |
| 1. | Radiation | - | Radiation is the transfer of thermal energy through thermal emission. | - |
| 2. | Types of Electrodes | - | i. Porous electrode ii. Non-porous electrode | - |
| 3. | Applications of fuel cells | - | i. Domestic use ii. Central power stations iii. Automotive vehicles | - |
| 4. | Types of power converters | - | i. AC to DC Converter (Controlled Rectifier) ii. DC to DC Converter (DC Chopper) iii. AC to AC Converter (AC voltage regulator) iv. DC to AC Converter (Inverter) | - |
| 5. | Chopper | - | A chopper is a static device that converts fixed dc input voltage to a variable dc output voltage directly. | - |
| 6. | Exothermic reaction | - | A chemical reaction in which heat is given out is known as exothermic reaction. | - |
| 7. | Advantages of biomass energy | - | i. Renewable, ii. Waste reduction & | - |

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| | | | iii. Reliability | |
| 8. | Disadvantages of biomass energy | - | i. High costs, ii. Space requirements | - |
| 9. | Fluidized bed gasifier | - | The operation of both up and downdraught gasifiers is influenced by the morphological, physical and chemical properties of the fuel. | - |
| 10. | Biophotolysis | - | Process by which water dissociates into molecular hydrogen and oxygen in biological systems in the presence of light. | - |
| 11. | Draft tube | - | Draft Tube is a diverging tube fitted at the exit of runner of turbine. | - |
| 12. | Transmission line | - | Carry the electric energy from one point to another in an electric power system. | - |
| 13. | Desilting tank | - | Remove suspended silt from (the water of a stream) a basin. | - |
| 14. | Dam | - | A dam is a barrier that stops or restricts the flow of water or underground streams. | - |
| 15. | Hydel power plant | - | The place where the electrical energy is generated with using a source of water (Dam) . | - |
| 16. | Advantages of wind energy | - | i. Reliable and Infinite renewable energy resource. ii. Wind energy is cost effective, and prices are dropping still. iii. Wind energy reduces carbon emissions when used instead of fossil fuels. | - |
| 17. | Disadvantages of wind energy | - | i. Wind farms can affect the visual appearance of the landscape. ii. Wind turbines can damage the habitats of birds and marine life. iii. Wind farms can be expensive to construct. | - |
| 18. | Basic components of wind energy conversion system | - | a. The rotor and its blades , b. The hub assembly, c. The main shaft, d. The gear box system, | - |

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| | | | <ul style="list-style-type: none"> e. Main frame, f. Yaw mechanism, g. Over speed protection, h. Electric generator, i. Yaw drive, j. Power conditioning equipment and k. Tower | |
| 19. | Function of yaw controller | - | The yaw control system aligns the turbine's nacelle with the wind direction in order to - minimize the yaw angle error, that is, the -result of the subtraction between turbine main axis angle and wind direction. | - |
| 20. | Torque coefficient | C_T | $C_T = T/T_{max}$ <p>Where T = shaft torque, AND T_{max} = torque at maximum efficiency.</p> | - |
| 21. | Different losses occurs in Solar Collector | - | <ul style="list-style-type: none"> i. Conductive Loss ii. Convective Loss iii. Radiative Loss | - |
| 22. | Types of concentrating collectors | - | <ul style="list-style-type: none"> i. Parabolic through collector ii. Mirror strip reflector iii. Fresnel lens collector iv. Flat plate collector with adjustable mirrors. v. Compound parabolic concentrator(C.P.C) | No Unit |
| 23. | Properties of materials used in Flat Plate Collector | - | <ul style="list-style-type: none"> i. Thermo-physical properties ii. Physical properties iii. Environment properties | No Unit |
| 24. | Power generation | - | The amount of electric energy produced by transforming other forms of energy into electrical energy. | KWh (or) MWh |
| 25. | Power distribution | - | Delivers the electric power to the customer at the required voltages. | KWh |

UNIT II - SOLAR ENERGY

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| 26. | Energy | - | Energy is defined as the ability to do work | Joule |
| 27. | Types of renewable energy | - | <ul style="list-style-type: none"> • Solar energy. • Wind energy. • Hydro energy. • Tidal energy. • Geothermal energy. • Biomass energy. | - |
| 28. | Solar energy | - | Solar power is energy from the sun that is converted into thermal or electrical energy. | - |
| 29. | Solar cell | - | A solar cell is an electrical device that converts the light energy directly into electricity by the photovoltaic effect. | - |
| 30. | Solar module | - | A solar module is normally series connected sufficient number of solar cells to provide required standard output voltage and power. | - |
| 31. | Photo voltaic | PV | Photo voltaic (PV) is the conversion of light into electricity using semiconducting materials | Volts |
| 32. | Solar array | - | Group of solar panels is called solar array. | - |
| 33. | Pyranometer | - | A pyranometer is a type of actinometer used for measuring solar irradiance on a planar surface. | W/ m ² |
| 34. | Solar constant | G _{sc} | The solar constant is a flux density measuring mean solar electromagnetic radiation (solar irradiance) per unit area. | W/ m ² |
| 35. | Solar radiation | - | Solar radiation is radiant energy emitted by the sun from a nuclear fusion reaction that creates electromagnetic energy. | W/ m ² |
| 36. | Solar collectors | - | A solar collector is a device that collects and/or concentrates solar radiation from the Sun. | W/ m ² |
| 37. | Types of solar collectors | - | <ol style="list-style-type: none"> 1. Flat-plate collectors 2. Concentrating collectors | W/ m ² |
| 38. | Flat-plate collectors | FPC | A FPC is a device to collect solar energy and transform it into thermal energy by using water as a working fluid. | W/ m ² |
| 39. | Concentrating collectors | - | In concentrating collectors, solar energy is optically concentrated before being transferred into heat. | W/ m ² |
| 40. | Battery |  | combination of one or more electrochemical cells that are capable of converting stored chemical energy into electrical energy | Volts |
| 41. | Advantages of Concentrating Collectors | - | <ol style="list-style-type: none"> 1. No Fuel Cost 2. Predictable 24/7 Power 3. No Pollution | - |

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| 42. | Applications of solar energy | - | <ul style="list-style-type: none"> i. Solar water heating ii. Solar heating of buildings iii. Solar distillation iv. Solar pumping v. Solar drying of agricultural and animal products vi. Solar furnaces vii. Solar cooking viii. Solar electric power generation ix. Solar thermal power production x. Solar green houses | - |
| 43. | Diode | | A diode is a semiconductor device that essentially acts as a one-way switch for current. | volts |
| 44. | Alternating current |  | A current periodically changing direction and magnitude is called Alternating current(AC). | Ampere |
| 45. | Direct current |  | Direct current (DC) is an electric current that is unidirectional, so the flow of charge is always in the same direction. | Ampere |
| 46. | Inverter | - | An inverter is a device for converting DC to AC. | Volts |
| 47. | Direct radiation | - | Solar radiation received at the earth's surface without change of direction | - |
| 48. | Diffuse radiation | - | The radiation received of the Earth's surface being subjected to scattering in the atmosphere is called Diffuse radiation. | - |
| 49. | Global radiation | - | The sum of the Beam radiation and Diffuse radiation is referred as Total or Global radiation. | - |
| 50. | Different types of Air Heaters | - | <ul style="list-style-type: none"> i. Non-porous type air heaters. ii. Porous type air heaters. | - |
| UNIT III - WIND ENERGY | | | | |
| 51. | Renewable energy | - | Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. | - |

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| 52. | Non-Renewable energy | - | Non-renewable energy comes from sources that will run out or will not be replenished in our lifetimes or even in many, many lifetimes. | - |
| 53. | Types of renewable energy | - | <ul style="list-style-type: none"> i. Solar energy ii. Wind energy iii. Hydro energy iv. Tidal energy v. Geothermal energy vi. Biomass energy | - |
| 54. | Wind | - | Blowing of air in motion. | - |
| 55. | Wind energy | - | Wind energy (or wind power) describes the process by which wind is used to generate electricity. | - |
| 56. | Types of wind turbines | - | Horizontal axis wind turbines & Vertical axis wind turbines | - |
| 57. | Anemometer | - | Measure the wind speed and transmits wind speed data to the controller. | - |
| 58. | Blades | - | Wind blowing over the blades causes the blades to “lift” and rotate. | - |
| 59. | Rotor | - | The blades and the hub together are called the rotor. | - |
| 60. | Generator | - | Generator is an electrical device which converts mechanical energy in to electrical energy. | - |
| 61. | Wind turbine | - | The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. | - |
| 62. | Hub | - | The rotor hub is the component that usually holds the blades and connects them to the main shaft of the wind machine. | - |
| 63. | Gearbox | - | The gearbox in a wind <u>turbine</u> drive train must increase the <u>rotational speed</u> of the rotor to match that required by the generator. | - |
| 64. | Nacelle | - | Nacelle sits on top of a yaw bearing that allows it to rotate as the wind direction changes. | - |

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| 65. | Wind vane | - | Measure wind direction and communicates with the yaw drive to orient the turbine properly with respect to the wind. | - |
| 66. | Horizontal -axis wind turbine | HAWT | The horizontal-axis wind turbine is a wind turbine in which the main rotor shaft is pointed in the direction of the wind to extract power. | - |
| 67. | Vertical -axis wind turbines | VAWT | A vertical-axis wind turbines is a type of wind turbine where the main rotor shaft is set transverse to the wind while the main components are located at the base of the turbine. | - |
| 68. | Disadvantages of vertical axis wind turbines | - | <ul style="list-style-type: none"> • Less Rotation Efficiency. • Lower Available Wind Speed. • Component Wear-down. • Less Efficiency. • Self-Starting Mechanism | - |
| 69. | Transformer | - | Transformer is a static electrical device which is used to transfer power from one place to another without change of frequency. | - |
| 70. | Types of transformer based on voltage and current | - | Step up transformer & step down transformer | - |
| 71. | Step up transformer | - | A transformer designed to increase the voltage from primary to secondary is called a step-up transformer. | - |
| 72. | Step down transformer | - | A transformer designed to reduce the voltage from primary to secondary is called a step-down transformer. | - |
| 73. | Advantages of Darrieus Rotor | - | <ul style="list-style-type: none"> i. High speed ii. High efficiency iii. Potentially low capital cost | - |
| 74. | Tip Speed Ratio | TSR | TSR is defined as the ratio of the speed of the rotor tip to the free wind speed. $TSR = V_{tip} / V$ | - |
| 75. | Coupling | - | A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. | - |

UNIT IV BIO ENERGY

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| 76. | Biomass | - | Biomass is renewable organic material that comes from plants and animals. | - |
| 77. | Biomass energy | - | Organic material which is used to generate energy. | - |
| 78. | Bio-fuel | - | Bio-fuels are fuels derived from biomass – any matter derived from plants or animals. | - |
| 79. | Types of Bio-fuel | - | <ul style="list-style-type: none"> i. Ethanol, ii. Biodiesel, and iii. Bio-jet fuel. | - |
| 80. | Vegetable oils | - | Vegetable oils, or vegetable fats, are oils extracted from seeds, or less often, from other parts of fruits. | - |
| 81. | Methane | CH ₄ | A colourless, odourless flammable gas which is the main constituent of natural gas. | - |
| 82. | Biogas | - | Biogas is a type of bio-fuel naturally produced from the decomposition of organic matter. | - |
| 83. | Ethanol | CH ₃ CH ₂ OH | A colorless, flammable liquid produced by fermentation of sugars. | - |
| 84. | Fermentation | - | Chemical process by which molecules such as glucose are broken down anaerobically. | - |
| 85. | Anaerobic digestion | - | Anaerobic digestion is a process through which bacteria break down organic matter such as manure without oxygen. | - |
| 86. | Hydrolysis | - | Chemical breakdown of a compound due to reaction with water. | - |
| 87. | Pyrolysis | - | Pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen. | - |
| 88. | Types of Pyrolysis | - | <ul style="list-style-type: none"> i. Conventional/slow pyrolysis, ii. Fast pyrolysis, and iii. Ultra-fast/flash pyrolysis. | - |
| 89. | Photosynthesis | - | Photosynthesis is the process by which plants make their own food using carbon dioxide, water and sunlight. | - |
| 90. | Gasification | - | Gasification is a process that converts biomass- or fossil fuel-based carbonaceous materials | - |

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| | | | into carbon monoxide, hydrogen and carbon dioxide. | |
| 91. | Types of gasifiers | - | <ul style="list-style-type: none"> i. Downdraft gasifier, ii. Updraft gasifier , and iii. Cross-draft gasifier. | - |
| 92. | Advantages of gasifier | - | <ul style="list-style-type: none"> i. Very easy to operate the gasifier ii. Maintenance is easy iii. Sturdy in construction iv. Reliable in operation | - |
| 93. | Distillation | - | Process of purification of compounds based on their volatility. | - |
| 94. | Vaporization | - | Conversion of a substance from the liquid or solid phase into the gaseous (vapour) phase. | - |
| 95. | Yeast | - | Yeasts are eukaryotic, single-celled microorganisms. | - |
| 96. | Enzymes | - | A substance produced by a living organism which acts as a catalyst to bring about a specific biochemical reaction. | - |
| 97. | Microorganisms | - | <ul style="list-style-type: none"> i. Bacteria, ii. Protozoa, iii. Algae, and iv. Fungi | - |
| 98. | Starch | - | Polymeric carbohydrate consisting of numerous glucose units joined by glycosidic bonds. | - |
| 99. | Brewing | - | Production of beer by steeping a starch source in water and fermenting the resulting sweet liquid with yeast. | - |
| 100. | Endothermic reaction | - | A chemical reaction in which heat energy is absorbed is known as endothermic reaction. | - |
| UNIT - V OTHER RENEWABLE ENERGY SOURCES | | | | |
| 101. | Thermal | - | Thermal means caused by or related to heat or temperature. | - |
| 102. | Thermal energy | - | Thermal energy is energy that comes from a substance whose molecules and atoms are vibrating faster due to a rise in temperature. | - |

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| 103. | Geothermal energy | - | Heat energy is continuously produced inside the earth. | - |
| 104. | Geothermal power plant | - | The place where the electrical energy is generated by the use of geothermal energy. | - |
| 105. | Components of geothermal power plant | - | <ul style="list-style-type: none"> i. Steam turbine, ii. Generator, iii. Condenser, iv. Cooling tower, v. Gas removal system and vi. Hydrogen sulfide abatement system. | - |
| 106. | Function of a condenser | - | The function of the condenser in a refrigeration system is to transfer heat from the refrigerant to another medium, such as air and water. | - |
| 107. | Cooling tower | - | Cooling tower is a heat rejection device. | - |
| 108. | Function of a steam turbine | - | A steam turbine is a device that extracts thermal energy from pressurized steam and uses it to do mechanical work on a rotating output shaft. | - |
| 109. | Magma | - | Hot molten rock is called as Magma. | |
| 110. | Fumarols | - | Steam is continuously vented through fissures in the ground ,these vents are called fumarols. | |
| 111. | General categories of geothermal resources | - | <ul style="list-style-type: none"> i. Hydrothermal convective systems ii. Geo-pressure resources iii. Petro-thermal (or) hot dry rocks(HDR) iv. Magma resources v. Volcanoes | |
| 112. | Classification of Hydrothermal convective systems | - | <ul style="list-style-type: none"> i. Vapor-dominated system or dry steam fields ii. Liquid-dominated system or wet steam fields iii. Hot-water fields | |
| 113. | Types of Hyper-thermal fields | - | <ul style="list-style-type: none"> i. Wet fields ii. Dry fields | |
| 114. | Brine | - | Water saturated or strongly impregnated with salt. | |

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| 115. | 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. | |
| 116. | Ocean energy | - | Ocean energy refers to all forms of renewable energy derived from the sea. | |
| 117. | Types of ocean technology | - | There are three main types of ocean technology: i. wave, ii. tidal and iii. ocean thermal. | |
| 118. | Pump | - | A pump moves liquids or gases from a lower pressure to a higher pressure and is responsible for this difference in pressure. | |
| 119. | Purpose of compressor | - | The purpose of the compressor is to circulate the refrigerant in the system under pressure, this concentrates the heat it contains. At the compressor, the low pressure gas is changed to high pressure gas. | |
| 120. | Methods of OTEC power generation | - | i. Open cycle(Claude cycle) ii. Closed cycle(Anderson cycle) & iii. Hybrid cycle | |
| 121. | Entropy | H(s) | Entropy, the measure of a system's thermal energy per unit temperature that is unavailable for doing useful work. | |
| 122. | Open-cycle OTEC | - | The expanding vapour drives a low-pressure turbine attached to an electrical generator. | |
| 123. | closed cycle OTEC | - | A closed cycle utilizes the warm surface water to vaporize the working fluid in an evaporator. The vaporized fluid drives a turbine coupled to a generator. | |
| 124. | Deaerator | - | A deaerator is a device that removes oxygen and other dissolved gases from liquids. | |
| 125. | Heat Exchanger | - | A heat exchanger is a system used to transfer heat between two or more fluids. Heat exchangers are used in both cooling and heating processes. | |

PLACEMENT QUESTIONS

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| 126. | | | Tell us something about yourself | |
| 127. | | | Have you taken part in extra-curricular activities? | |
| 128. | | | What newspapers/books/magazines do you read? | |
| 129. | | | What's your greatest achievement? | |
| 130. | | | Do you have plans for further studies? | |
| 131. | | | What are your strengths and weaknesses? | |
| 132. | | | What is success for you? | |
| 133. | | | Why does this role interest you? why have you applied? | |
| 134. | | | What skills do you want to develop to success in the role? | |
| 135. | | | Can you work comfortably in a team? | |
| 136. | | | Are there any kind of people you cannot work with? | |
| 137. | | | Do you mind working in shifts? | |
| 138. | | | Do you have a valid passport? | |
| 139. | | | Why do you want to join our organization? | |
| 140. | | | How long will you work for us? | |
| 141. | | | What can you contribute for the organization? | |
| 142. | | | Why should we hire you? | |
| 143. | | | What salary are you expecting? | |
| 144. | | | How soon can you join us? | |
| 145. | | | Do you have any questions for us? | |
| 146. | | | What are your strengths and weaknesses? | |
| 147. | | | What is success for you? | |

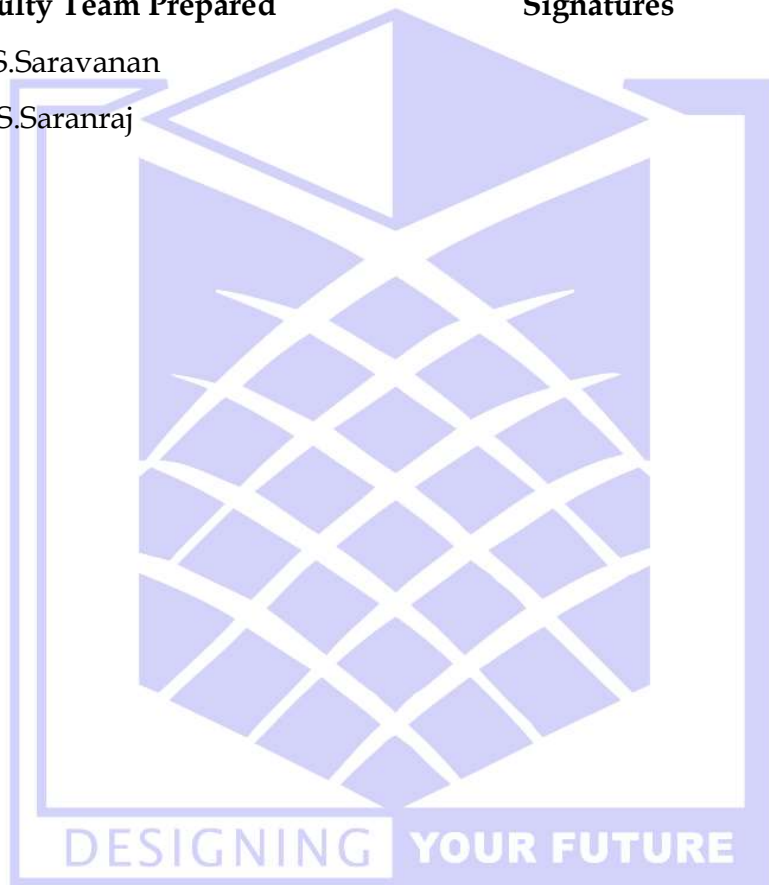
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|------|--|--|--|--|
| 148. | | | Why does this role interest you? why have you applied? | |
| 149. | | | What skills do you want to develop to success in the role? | |
| 150. | | | Can you work comfortably in a team? | |

Faculty Team Prepared

Signatures

1. Dr.S.Saravanan
2. Mr.S.Saranraj

HoD



Estd. 2000