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Internal Assessment Test 2 – July 2024

Sub:	Renewable Energy Resources					Sub Code:	21EE652	Branch:	All	brancl	nes
Date:	10.07.2024Duration:90 min'sMax Marks:50Sem / Sec:VI									0	BE
Answer any five questions								MA	RKS	СО	RBT
1 With a neat schematic, explain working of Stirling or Brayton heat engine system.								[]	10]	CO2	L2
2 Explain the principle of solar photovoltaic power generation and list the vital components of solar PV systems, with brief description.							ents [1	10]	CO2	L2	
3	Discuss the applications, advantages and disadvantages of hydrogen energy.								10]	CO2	L2
4	Discuss wind characteristics and guidelines for wind turbine site selection.								10]	CO2	L2
	With help of a neat diagram, explain working of a binary cycle based geothermal power plant							mal [1	10]	CO3	L2
6	Explain the parts of wind turbine with a neat diagram								10]	CO3	L2

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CMP Stirling / Brayton heat Engine system: he 0 + it is servilled to the areignt had enquinge which is has \* schematic representation - many poor many how more Solar collecto can be ain and one liguid boiler mulemagnest prestad for NUM- long natural 1- The tradicity - Han fuel with the mechanical the Superheater bad Ty Turbine Itp electric Solah steam generalo generator condenser Cooling tower Brayton Heat Engine

+ working of stalling or Bragton head enquier? \* It is similar to the ancient heat enginge, which is has been used from 100 of years \* the array of mirrors are reflected from the sunalight in order to heat up the working fluid, the working fluid can be air and any liquid which has lover boiling temperature \* Their reduces the cost of fuel and the energy utilization \* The fluid converts into the steam when It is heated and then rotates the turbine \* The turbine then converts the votational timetic energy into the mechanical energy \* The mechanical energy is converted into the electrical energy with the help of generators. to These power is used to non the small motor, and plant and reactor. + Here the fluid gets headed and pumped with the help of solar pur & The working fluid gets condensed and cost, with the help of cooling towers and condensor \* In this heat engine the ruspretory or is used which is used to collect the waste heat and utize it efficiently



3 \* Methods of Energy Storage = of Hydrogen quite challenging, because of \* Storing of the hydrogen is its physical properties. \* It has high energy density in terms of its weight (3 times greater than gasoline) \* it has low energy dennity in form of its volume \* Hydrogen based vehicles should fravel 470 km in between one fills hence storing of hydrogen requires more physical space than compared to just like petrol and diesel. ve have 2 procedurest (i) Compressed gaves and liquid hydrogen storgage tanks (i) Material based storage. prodos bus erround with sin first process we store the hydrogen in the recervoir or tanks by applying pressure is is melling est and & second process has 2 types storing by a) adsorption b) absorption ) metal nychrides + in adsorption the hydrogen molecules or atomy gets adsorbed on the surface of the material -\* in absorption the hydrogen molecule gets incorporated into the solid lattice framework

Based on the above observations we have 3 methods of hydrogen energy storage The highingen is quite challenging, because 1) Compression 2) liquified hydrogen That they energy deal (which the mark the materia) 3) Metal hydrides. It has low except description in fermine of the wolling "Compression" The hydrogen are presorved in the large tankes or the underground preservoir. \* But the energy efficiency à poor around (60-75./.) + it is the conventional method of storing. 2) Agentied hydrogent The hydrogen are compressed under high pressure and cooling + it has more energy density compared to traditional methods. it is more efficient as well + But the problem is it should be stored below the temperature 20.27K 3) Metal hydnides:-\* There are materials which can store the hydrogen & The hydrogen atoms are incoporated into them and

whenner required they are removed from the parent material + They are easy to transport, and carry. \* They are some efficient as liquified hydrogen. (4) Wind characteristics + \* Before installing the wind turbines, we need to keep in mind some of the wind characterstics, in order to yield the better output. \* The characteristics are:-· Mean wind speed + HEW HAR · wind speed patterns · wind shear (profile) + Tumpelence offect · turbelence and opstacles \* the obove characteristics require some calculations and barrie tools to measure their properties, but no calculation, can compare the on site wind measuring campaigns. & The speed of the wind changes anually, downal, and seasonal patterns; \* mean wird speed determines the parameters like height and length of the turbine.

to by having the proper equipment and the area of installation and teeping the characteristic of wind we can have the following benifits -> Increases the efficiency Reduces the near and tear of the internal parts of turbine - Given the longer lifetome for the machine 1 2moz bling 11 > more output is youlded at Guidelines for wind turbine site selection & following guidlines should be taken care before installing \* Hill effect \* wind shear effect \* Tunnel effect \* Turbelence affect. us belience and children. \* Disturbance from the obstacles \* Wind speed and direction + Hill effect usually refers to direction and speed of the wind is very high in the top of the hill, it can be advantageous to set up the tuskine that place.

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\* In the tunnel effect the wind speed will increases when it come across the solid obstacles, hence when we set up wind mill in <u>between</u> the building and in between the 2 mountains it ach as a funnel, and wind speed will be more compared to the surrounding area.

- \* turbelence effect -> turbelence is resistance in the air which causes slow down of the notation of the notor, it is reduced by setting the turbine and the proper design of the blades.
- \* disturbance from the physical obstacles. . in the urban at area, the speed of the wind reduces due to the tall building, object and trees. Hence one should avoid selecting this kind of areas. " wind speed direction :- The direction and speed of the wind is more during the day time, this is at due to sun rise heats up the air and cloud become ters denser. " when the blade is straight upwards and when the

wind hit tip of the blade that is 11 km/hour and when the blade is straight downwards and wind hits the tip of blade at 9 km/hour, then the difference between their speed causes shearing effect, this is due to height difference.

(1) 5 Dry steam based geothermal power plant Ex Sketch? Ino publied and mouth a fun fring go new mentar esner not that w + Sketching have demand of st generator in 1 1100 9 . para pridendernus - load -turbine == 1 - fers belence A A and a shift a shak water water water a rentance in the what he patrict the ingo NEDA H water ply we Mair-Xair the ppeak of the mind rocker pump + pal ent his Condensor Cooling should avoid selecting this pinds funnel which grad preduces in the direction and speed of the way is married dering aller day terre N t auto wat 1 get aloget artist wat Co geothermal fluid 1 11 injection well the production Atraight downwards Aid hier well T Dry steam geothermal pour plant

+ Explain ation 3 \* The this geothermal power plant, the hydro thermal water is directly pumped into the tustine, this steam is used to expand and rolate the blades of the tarbine who are is all portions all & in they method the geothermal steam from the underground recencoir à pumped, during this pumping we come across several fotters like. THE about a · Pock catcher · scrubber solid upend remoner standbringer all mi \* Rock catcher will catch the large solid and rock particles from the steam, then we have the fotton to remore the small solid particles. \* Scrubber is used to remove the suspended particulate matters from the steam · Then the steam from the turbine & passed to the condensor which gets condensed send cool with the help of funnel coller and the water get collected back the well with the help of injection well. \* This is the fra plants present in the geyrer of california. which are rare to find

CMR

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V-E characteristics of solar cell and maximum Poner point: 2 ett elstor love brogue it I the output of the vi characteristic of the solar of 1 guien by enneater all builters part is  $V = (kT|e) \log (1 + (\overline{J}_{x} - \overline{J}) / \overline{J}_{0}) \rightarrow 0$ \* in th neg "The above equation is the output voltage of the solar NO cell. ne A In the VI characteristic of solar cel, the horizontal in axis is the voltage output and the nectical axis is the output current. of T rate the fatter a remark the small solid particle. 100mw/cm² > voltage Czc controlled melon 75mW cm2 dervice Daput 50 mw cm2 mother the steam for awrent 25mw cm2 alt ET help of - permal calles and the water get Mars nastrajais de ples - Al ABus eller ent 0] 0-1 0-2 0.3 0.4 Voc deriver of I-V characteristice. Output aliforn

\* in the it characteristics we mainly come across the 2 charactersty () · Element - bichnass · short circuit current (Isc) · Open circuit voltage (Voc) The dead theirs can be want builts on \* in the short circuit current, the positive and the negative terminals of the solar cell is shorted and voltage near them à zero, and bad reistance is null. ollassification of bionassi-\* in the open circuit voltage, the voltage across the terminals of the solar call, when the load resistance is infinity + The ideal solar cell has the below VI characteristics 1 Isc Imp maxvoltage + aquicultural waste ideal solar cell characteriplity Vmax Voc -> 01 NI IS HAMAN IN TH te get the maximum power we have P=VI (Is- To) ( exp[ke] T) log = ( Is- Z) [ To) } V.