NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - THEORY EXAMINATION (2021 - 2022)

Subject: Energy Science & Engineering

Time: 03:00 Hours   Max. Marks: 100

General Instructions:

   1. All questions are compulsory. It comprises of three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

<div align="center">SECTION A   20</div>

1. Attempt all parts:-

1-a.   What is the reason behind the fact that the absolute zero entropy value is not attainable?   1
       (CO1)

         1. because absolute zero temperature is not attainable in finite number of operations

         2. because theoretically absolute zero temperature has negative value of entropy and it is not possible

         3. Both a. and b.

         4. none of the above

1-b.   Entropy may decrease locally at some region within the isolated system. How can this   1
       statement be justified? (CO1)

         1. this cannot be possible

         2. this is possible because entropy of an isolated system can decrease.

         3. it must be compensated by a greater increase of entropy somewhere within the system.

         4. none of the mentioned

1-c.   Why neutrons with lower energy should be capable of causing fission? (CO2)   1

         1. For faster reaction process

         2. For sustained reaction process

         3. For Safety purpose

         4. In order to not waste the nuclear fuel

1-d.   How many number of nuclei of hydrogen fuse in a series of reaction involving other   1
       particles that continually appear and disappear? (CO2)

1. 1
2. 2
3. 3
4. 4

1-e.   How many types of solar cells? (CO3)   1
       1. One
       2. Two
       3. Three
       4. Four

1-f.   The solar heater life span is around _____ (CO3)   1
       1. 4-5 years
       2. 2-6 years
       3. 1-2 years
       4. 6-7 years

1-g.   Which statement about hydroelectric power plant is wrong? (CO4)   1
       1. Efficiency of hydroelectric power plant does not reduce with age
       2. Its construction coast is very high and takes a long time for erection.
       3. It is very neat and clean plant because no smoke or ash is produced.
       4. Meeting rapidly changing load demands is not possible in hydroelectric power plant.

1-h.   What is major disadvantage of wave energy? (CO4)   1
       1. It is not efficient enough
       2. It is available only in ocean
       3. The harnessing cost is more
       4. Unstable during high wind pressures

1-i.   Which one of the following is not considered to be a fossil fuel? (CO5)   1
       1. Bio gas
       2. uranium
       3. coal
       4. crude oil

1-j.   What is the order of waste management hierarchy, from most to least favoured? (CO5)   1
       1. Prevention- Recycle-Reuse- Disposal
       2. Prevention-Reuse-Disposal-Recycle
       3. Prevention-Disposal -Reuse-Recycle
       4. Prevention-Reuse-Recycle-Disposal

2. Attempt all parts:-

2-a.   What do you mean by Energy Conversion? (CO1)   2

2-b.   How many neutrons are released when Ba and Kr are formed? (CO2)   2

2-c.   How can we store the energy obtained from solar cells? (CO3)   2

2-d.   What is meant by pitch angle? (CO4)   2

| 2-e. | What makes a building "green"? (CO5) | 2 |

<div align="center">SECTION B   30</div>

3. Answer any <u>five</u> of the following:-

3-a.	Using P-V and T-S diagram describe various processes of Stirling cycle and derive its efficiency. (CO1)	6
3-b.	With sketches discuss working principle of various controls of Steam turbine power plant and drive the efficiency of ideal Rankine cycle. (CO1)	6
3-c.	Explain the differences between Alpha, Gamma and Beta radiations. (CO2)	6
3-d.	What are the Various health hazards of a nuclear power plant? What are the preventive measures taken to avoid health hazards from a nuclear power plant? (CO2)	6
3-e.	Explain the concept of solar constant. How do we find solar constant? (CO3)	6
3-f.	Derive an expression for energy that can be extracted from wind. (CO4)	6
3-g.	How is green building related to smart growth and sustainable development? (CO5)	6

<div align="center">SECTION C   50</div>

4. Answer any <u>one</u> of the following:-

| 4-a. | What do you mean by Energy interactions? Explain the two types of energy interactions for a closed system. (CO1) | 10 |
| 4-b. | An air-conditioner provides 1 kg/s of air at 15°C cooled from outside atmospheric air at 35°C. Estimate the amount of power needed to operate the air-conditioner. (CO1) | 10 |

5. Answer any <u>one</u> of the following:-

| 5-a. | Draw the binding energy curve showing variation of binding energy per nucleon with mass number. With the help of this curve, explain the phenomenon of nuclear fusion and fission. (CO2) | 10 |
| 5-b. | What is a CANDU type reactor? Explain with a sketch its main features. What is a calandria? (CO2) | 10 |

6. Answer any <u>one</u> of the following:-

| 6-a. | Explain with a neat sketch the working principle of standalone and grid Connected solar system. (CO3) | 10 |
| 6-b. | Calculate the angle made by beam radiation with the normal to a flat collector on December 1 at 9AM solar time for location at 28 Degree 35Min North the collector is tilted at an angle of latitude + 10 Degree with horizontal and pointing due south. (CO3) | 10 |

7. Answer any <u>one</u> of the following:-

| 7-a. | Derive the expression for the power and efficiency of thermionic generator. (CO4) | 10 |
| 7-b. | Explain Hot Dry rocks (petro thermal) resources of geothermal energy and how they can be exploited as a source of energy? (CO4) | 10 |

8. Answer any <u>one</u> of the following:-

| 8-a. | Briefly describe the economic reforms in Coal, oil and natural gas and electricity sectors. (CO5) | 10 |
| 8-b. | What is energy audit? Explain how energy audit is helpful in energy conservation? (CO5) | 10 |