INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**RENEWABLE ENERGY SOURCES**
Course Code	:	**A80324**
Class	:	IV B.Tech II sem
Branch	:	Mechanical Engineering
Year	:	2018 – 2019
Course Faculty	:	Mr. G Saratraju, Assistant Professor, Mr. A. Venuprasad, Assistant Professor

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

S. No	Question	Blooms Taxonomy Level	Course Outcome
Part A-Short (Answers Questions)			
UNIT – I			
1	What are the disadvantages of solar energy?	Understand	1
2	What are the indirect forms of solar energy?	Understand	1
3	Describe how energy continuously being produced in the sun?	Understand	1
4	Define declination angle?	Remember	2
5	Define hour angle?	Understand	3
6	Define Zenith angle?	Remember	3
7	Define solar azimuth angle?	Understand	1
8	Define angle of incidence?	Remember	2
9	Define beam radiation?	Understand	1
10	Define diffused radiation?	Understand	1
11	Define global radiation?	Remember	1
12	Describe extraterrestrial radiation?	Understand	1
13	Define solar irradiance?	Understand	1
14	Define solar constant?	Understand	2
15	Describe terrestrial radiation?	Remember	2
16	Describe flat plate solar collector?	Understand	1
17	List out the instruments for measuring solar radiation?	Understand	3
18	List any two applications of solar energy?	Understand	1
19	Describe the Principle of operation of a sunshine recorded?	Understand	3
20	Define surface Azimuth angle?	Remember	1
Part B-Long (Answers Questions)			
1	What is beam and diffused radiation?	Understand	1
2	Explain the solar spectral irradiance in detail	Understand	2
3	Briefly explain the role and potential of new and renewable energy with reference to India	Understand	1

4	What is a solar constant? Differentiate direct and diffused solar radiation.	Remember	2
5	Describe the working of any one instrument used for the measurement of solar radiation, with a neat diagram	Understand	1
6	What is the difference between a pyrhelimeter and a pyranometer?	Remember	1
7	Describe the principal of asngs from type pyrheliometer?	Understand	1
8	Write notes on beam and diffuse radiation?	Remember	3
9	What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere?	Understand	1
10	Define solar constrant hour angle?	Understand	2
11	Define and explain the following with neat diagrams: i. Solar azimuth angle ii. declination angle iii. hour angle iv. altitude angle	Remember	1
12	Explain any one instrument for measuring solar radiation.	Understand	2
13	Explain the construction and operation of any two instruments used for measuring solar radiation	Understand	3
14	Briefly describe the impact of solar power on environment.	Understand	1
15	Explain Extraterrestrial and terrestrial solar radiation.	Remember	3
16	Briefly describe the impact of solar power on environment.	Understand	2
17	List out the advantages of direct energy connection system?	Remember	3
18	Discuss in detail the various parameters to be considered in detail for the design of Solar water heating systems and its efficiency	Understand	3
19	Explain the solar spectral irradiance in detail	Remember	2
20	List out the instruments for measuring solar radiation?	Understand	2
Part –C (Analytical Questions)			
UNIT – I			
1	What are the basic features required in an ideal pyranometer?	Understand	3
2	What are the converstional sources of energy and explain briefly?	Understand	3
3	What are the non convertional sources of energy and explain briefly?	Understand	3
4	Describe the percentage – wise distribution of various components in the extraterrestrial radiation?	Remember	3
5	What are the indirect forms of solar energy?	Understand	3
Part A-Short (Answers Questions)			
UNIT II			
1	Write a note on total solar energy received in India?	Understand	4
2	List three types of solar energy collectors?	Understand	5
3	List any two types of advanced solar collectors?	Understand	4
4	Define solar insulation?	Remember	5
5	Define collector efficiency?	Understand	4
6	Define solar energy?	Understand	5
7	What is diffuse radiation?	Understand	4
8	List the instruments used for measuring sunshine?	Understand	5
9	Define PV effect?	Remember	4
10	List different applications of solar PV system in rural area?	Understand	5
11	List components of solar water heater?	Understand	4
12	Describe solar distillation?	Understand	5
13	Describe a solar thermal collector?	Understand	4
14	Describe concentration type solar collector?	Remember	5
15	Define sensible heat?	Understand	4
16	Define latest heat?	Understand	5
17	What is green house?	Understand	4
18	List out the advantages of a solar PV system?	Remember	5
19	List out the disadvantages of solar PV systems?	Understand	4
20	List out the advantages of direct energy connection system?	Understand	5
Part B-Long (Answers Questions)			
1	Explain the construction and working of solar flat plate collectors.	Understand	4

2	Explain the various configurations for the solar concentrating collectors	Understand	4
3	Differentiate flat plate collector and parabolic collector with their salient features	Understand	5
4	Explain the working of solar concentrator	Remember	4
5	Describe the basic components of flat plate collector with a neat sketch	Understand	5
6	Explain the principle of conversion of solar energy into heat?	Remember	4
7	How solar air collectors are classified? What is the main application of a drier?	Understand	5
8	Describe a solar collector use in power plant for generation of electric energy?	Remember	4
9	Why orientation is needed in concentrating type collectors?	Understand	5
10	Enumerate different types of concentrating type collectors?	Understand	4
11	Discuss the thermal analysis of flat plate collector with necessary equations.	Remember	5
12	Explain the thermal analysis of flat plate collectors with necessary equations	Understand	4
13	Explain the thermal analysis of flat plate collectors with necessary equations	Understand	5
14	With the aid of neat sketch classify flat plate collectors for water/air heating.	Understand	4
15	Describe thermal analysis of Owen-illinois collector	Remember	5
16	Explain the characteristic curve of a liquid flat plate	Understand	4
17	Define solar energy?	Remember	5
18	List components of solar water heater?	Understand	4
19	Define latest heat?	Remember	5
20	List out the advantages of a solar PV system?	Understand	4
Part –C (Analytical Questions)			
UNIT II			
1	Write short note on different types of solar energy collectors with neat diagrams?	Understand	5
2	Write short notes on a. Solar radiation b. Power generation using solar tower concept?	Understand	4
3	Enumerate the different types of concentrating types of concentrating types collectors?	Understand	5
4	With the help of neat sketch describe a solar heating system using water heating solar collectors? What are the advantages and disadvantages of this method?	Remember	4
5	Explain the principle of building integrated PV system with suitable sketch?	Understand	5
Part A-Short (Answers Questions)			
UNIT III			
1	List out factors responsible for distribution of wind energy on the surface of earth?	Understand	7
2	Describe wind power?	Understand	7
3	Mention two important wind turbine generator installations in India?	Understand	8
4	Explain wind power equation?	Remember	8
5	What is the type of generator used in wind power plant?	Understand	9
6	What are wind forms?	Remember	9
7	How the wind mills are classified?	Understand	7
8	List out the advantages of wind power?	Understand	8
9	List out the disadvantages of wind power?	Understand	9
10	Describe vertical axis wind turbine?	Understand	7

UNIT III			
Part B-Long (Answers Questions)			
1	Explain the construction and working of a solar pond with neat sketch. What are its advantages and disadvantages?	Understand	7
2	Discuss in detail the various parameters to be considered in detail for the design of Solar water heating systems and its efficiency	Understand	7
3	Discuss in detail about performance characteristics of Horizontal windmills.	Understand	8
4	Discuss in detail about performance characteristics of Vertical windmills.	Remember	8
5	Explain in detail about principle of solar heating and give its applications.	Understand	9
6	Write short notes on hydrogen storage and electromagnetic energy storage.	Remember	9
7	What is principle collection of solar energy used in a non-convective solar pond?	Understand	7
8	Write short notes on heat extraction method from a solar pond.	Remember	8
9	What are the main elements of a photovoltaic system?	Understand	9
10	Explain in detail about solar distillation and solar pumping with neat sketch.	Understand	7
Part –C (Analytical Questions)			
UNIT III			
1	Explain with a neat diagram the working of various types of wind generators?	Understand	7
2	What are the factors affecting bio-gas generation?	Understand	7
3	Explain with a neat sketch the working principle of standalone and grid Connected solar system	Remember	8
Part B-Short (Answers Questions)			
UNIT III			
1	Define bio-mass?	Understand	7
2	What range of wind speed is considered favorable for wind power generation?	Understand	7
3	Explain the mechanism of production of local winds?	Understand	8
4	List out the bio-mass resources?	Remember	8
5	List out the biomass conversion technologies?	Understand	9
6	Describe Anaerobic fermentation?	Remember	9
7	Describe aerobic fermentation?	Understand	7
8	List out advantages of Anaerobic digestion?	Remember	8
9	Describe the utilization of biogas in IC engines?	Understand	9
10	List out operation parameters of a biogas plant?	Understand	7
UNIT III			
Part B-Long (Answers Questions)			
1	Explain the non-convective solar ponds with its new design features	Understand	7
2	Derive an expression for daily yield that can be obtained in a solar still	Understand	7
3	Explain the working of conventional solar still with an neat diagram	Understand	8
4	Explain the construction and operation of a solar still.	Remember	8
5	What is Photo voltaic cell? Discuss about its 3characteristics?	Understand	9
6	What is the type of generator used in wind power plant?	Remember	9
7	List out the biomass conversion technologies?	Understand	7
8	List out the main elements of a photovoltaic system?	Remember	8
9	Explain with a neat diagram the working of various types of wind generators?	Understand	9
10	Describe the potential for wind power in India.	Understand	7

Part –C (Analytical Questions)			
UNIT III			
1	Explain briefly about the horizontal wind mills with neat sketch?	Understand	7
2	Explain briefly about the vertical wind mills with neat sketch?	Understand	7
3	With neat diagram, Explain how wind energy can be converted into electrical energy?	Remember	8
Part A-Short (Answers Questions)			
UNIT – IV			
1	How can geothermal energy be utilized for electricity generation?	Understand	10
2	Write the Principle of operation of wave power generation?	Remember	11
3	Describe tidal Power generation?	Understand	10
4	Describe wave power generation?	Understand	11
5	List out the resources of geothermal energy?	Remember	10
6	Describe the geothermal power?	Understand	11
7	List out few projects harnessing tidal Power?	Understand	10
8	Discuss the disadvantages of geothermal plant?	Understand	11
9	Discuss the advantages of geothermal plant?	Remember	11
10	Discuss the advantages of tidal power plant?	Understand	10
11	Mention the types of tidal power turbines?	Understand	11
12	Differentia tidal and wave?	Understand	11
13	What are the environmental impacts of geo thermal energy?	Remember	11
14	What are the environmental impacts of OTEC?	Understand	10
15	List out the advantages of OTEC systems?	Remember	10
16	List out the disadvantages of OTEC systems?	Understand	10
17	Where is the largest tidal plant located?	Remember	11
18	List out the advantages of ocean wave energy?	Understand	10
19	List out the Disadvantages of ocean wave energy?	Understand	11
20	List out the technologies available for OTEC?	Remember	10
Part B-Long (Answers Questions)			
UNIT – IV			
1	Explain various configurations of wind turbines in detail with neat diagram	Understand	10
2	Explain the phenomenon of dynamic matching in wind turbine.	Understand	10
3	Describe the potential for wind power in India	Understand	10
4	Classify different wind turbines with diagram	Remember	10
5	List out the differences between horizontal and vertical wind mills.	Understand	10
6	Describe horizontal axis type aero generators?	Remember	10
7	Briefly explain wind energy storage, savonius rotor?	Understand	10
8	Describe the main applications of wind energy, giving neat sketches?	Remember	10
9	Describe the different schemes for wind electric generation or describe the generating systems?	Understand	10
10	Describe the main considerations in selecting a site for wind generators?	Understand	10
11	Derive an expression for axial force on the turbine blade.	Remember	10
12	Briefly explain the significance of Betz limit.	Understand	10
13	Derive that the maximum power that can be extracted from a horizontal axis wind turbine is only 59%	Understand	10
14	Explain the importance of torque coefficient of a wind turbine.	Understand	10
15	Derive an expression for axial force on the turbine blade.	Remember	10
16	Discuss the advantages of tidal power plant?	Understand	10
17	Discuss the disadvantages of geothermal plant?	Remember	11
18	What are the main types of OTEC power plants? Describe their working in brief?	Understand	11
19	Explain the process of anaerobic digestion with a neat block diagram.	Remember	11
20	How are gasifiers classified? What is pyrolysis?	Understand	11

Part –C (Analytical Questions)			
UNIT –IV			
1	Explain with neat sketches, the operation of a geothermal power plant?	Understand	10
2	Explain with neat sketch, the methods of operation of tidal power generation?	Understand	10
3	What are the advantages and disadvantages of wane energy conversion?	Understand	10
4	What are the main types of OTEC power plants? Describe their working in brief?	Remember	11
5	Explain how ocean tides are generated and how the power can be tapped? Discuss the limitations of this method?	Understand	11
Part A-Short (Answers Questions)			
UNIT – V			
1	Describe the need for direct energy convention?	Understand	12
2	Explain seebeck effect?	Understand	13
3	Explain peltier effect?	Understand	12
4	Explain joule Thompson effect?	Remember	13
5	Explain the principle of direct energy conversion?	Understand	12
6	Describe electron gas dynamic conversion?	Remember	13
7	Describe the principle of MHD generator?	Understand	14
8	Define Dissociation?	Remember	12
9	Define ionization?	Understand	13
10	Describe faraday's laws?	Understand	12
11	List out the thermoelectric materials?	Remember	14
12	Mention the applications of thermo electric materials?	Understand	15
13	Describe the thermoelectric effect?		14
14	List out the advantages of fuel cells?	Understand	15
15	List out the disadvantages of fuel cells?	Understand	15
16	Define fuel cells?	Understand	14
17	Define magnetic flux?	Remember	15
18	Differentiate between ordinary batteries and fuel cell?	Understand	14
19	Describe carnot cycle?	Remember	15
20	List out the limitations of direct energy conversion?	Understand	14
Part B-Long (Answers Questions)			
UNIT – V			
1	What is anaerobic digestion? Explain how biogas is produced by anaerobic digestion.	Understand	12
2	Discuss the present status of development of biomass energy resources in India. Classify biogas digesters and explain working of any one of them.	Understand	13
3	Explain the process of production of Bio-gas from bio-mass.	Understand	12
4	Explain the process of anaerobic digestion.	Remember	13
5	What are the main advantages of anaerobic digestion of biomass?	Understand	12
6	How are gasifiers classified? What is pyrolysis?	Remember	13
7	What are the main plants proposed is for energy plantation especially in India?	Understand	14
8	Give a list of materials used for biogas generation?	Remember	12
9	What is meant by energy plantation? What are its advantages and disadvantages?	Understand	12
10	What are the factors which affect the size of biogas plant?	Understand	13
11	Explain the construction and working of Janata biodigester with a neat sketch	Remember	14
12	Classify biogas digesters and explain working of anyone of them	Understand	15
13	Discuss the present status of development of biomass energy resources in India	Understand	14
14	Explain about the energetic involve in an aerobic digestion.	Understand	14
15	Explain the S.I engine operation using bio-gas.	Remember	15

16	Classify biogas digesters and explain working of any one of them	Understand	14
17	List out the bio gas sources?	Understand	15
18	Describe gasifiers?	Understand	15
19	Describe pyrolysis?	Remember	14
20	Describe digester?	Understand	15
Part –C (Analytical Questions)			
UNIT – V			
1	Describe the classification of fuel cells?	Understand	12
2	Comment on relative performances of various types of fuel cells?	Understand	13
3	Draw a conceptual block diagram of a fuel cell power plant and explain the details of each block?	Understand	12
4	Describe the basic principle of operation of an MHD generator. Derive expression for maximum power generation per unit volume of a generator?	Remember	14
5	Explain the heating and cooling applications of a thermo electric system common on the type of materials used for low and high temperature applications?	Understand	15

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