



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING TUTORIAL QUESTION BANK

Course Name	SOLAR ENERGY SYSTEMS
Course Code	AME525
Class	VI Semester
Branch	Mechanical Engineering
Year	2018-2019
Course Coordinator	Mr. M. Sunil Kumar, Assistant Professor, Department of Mechanical Engineering
Course Faculty	Mr. M. Sunil Kumar, Assistant Professor, Department of Mechanical Engineering

COURSE OBJECTIVES:

The course should enable the students:

I	Understand the concept related various laws in solar engineering
II	Outline the basic idea of solar energy collecting as well as energy storage devices.
III	Development of solar cells and photo voltaic cells.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AME525.01	Understand types and applications of various form of energy sources and its environmental impacts.
AME525.02	Construct a practical knowledge on various devices of solar PV systems and trying with an assortment of parameters.
AME525.03	Generate perception on practice usages of solar PV gadgets/ industrial utilities.
AME525.04	Explain the various characteristics of the solar cell under local climatic working conditions.
AME525.05	Visualize the performance of the Solar PV cell under various specified operating temperature ranges and will be able to relate it with nominal values.
AME525.06	Explain to clarify impression of various solar thermal energy collectors.
AME525.07	Summarize the basic economics of solar energy collection system.
AME525.08	Delineate the other applications and the devices used to collect solar energy.
AME525.09	Explain the performance of the solar PV cell under various specified operating temperature ranges and will be able to relate it with nominal values.
AME525.10	Understand the concept and the diverse materials used for solar devices.
AME525.11	Explicate in depth knowledge of about solar cells, thermal energy storage and electrical energy storages.
AME525.12	Learn the fundamental concepts about solar energy systems and devices.
AME525.13	Study about approaches for the storage of solar energy along with solar energy collectors.
AME525.14	Explain the fundamental concepts of solar energy power generating systems and devices.
AME525.15	Analyze various types of energy storage devices and perform the selection based on techno-economic view point.
AME525.16	Explore the use of modern engineering tools, software and equipment to prepare for competitive exams, higher studies etc.

UNIT – I			
INTRODUCTION TO SOLAR ENERGY			
Part - A (Short Answer Questions)			
S. No	QUESTION	Blooms Taxonomy Level	Course Learning Outcomes
1	What is the difference between renewable energy and non-renewable energy?	Remember	AME525.01
2	Define renewable energy.	Understand	AME525.02
3	Define solar energy.	Understand	AME525.01
4	Discuss in brief history of solar energy.	Remember	AME525.01
5	Summarize the various approaches of utilizing solar energy.	Remember	AME525.02
6	Explain black body radiation.	Understand	AME525.01
7	Discuss the relation between radiation field energy density and radiation spectrum.	Understand	AME525.01
8	Discuss about radiation spectrum.	Remember	AME525.01
9	Explain in detail plank's theory.	Understand	AME525.02
10	Explain briefly about plank's formula in energy unit.	Understand	AME525.01
11	Discuss about plank's formula in wavelength unit.	Remember	AME525.01
12	Define wien's displacement law.	Remember	AME525.02
13	Explain Stefan-Boltzman's law.	Understand	AME525.01
14	Discuss about Einstein theory of photons.	Understand	AME525.01
15	Summarize derivation of the black body formula.	Remember	AME525.02
16	Explain photoelectric effect.	Remember	AME525.01
17	Discuss about radiation spectrum.	Understand	AME525.01
18	Summarize maximum spectral density.	Understand	AME525.02
19	List the solar energy utilizations.	Remember	AME525.02
20	Define black body radiation.	Remember	AME525.01
Part - B (Long Answer Questions)			
1	List out the various approaches of utilizing solar energy.	Remember	AME525.01
2	Briefly explain blackbody radiation.	Understand	AME525.02
3	Explain relation between radiation field energy density and radiation spectrum.	Understand	AME525.01
4	Discuss Planck's formula in energy unit.	Remember	AME525.01
5	Explain Einstein's derivation of the black body formula.	Remember	AME525.02
6	Briefly explain photoelectric effect.	Remember	AME525.01
7	State the importance of Stefan-Boltzmann law.	Understand	AME525.02
8	Briefly discuss Einstein's theory of photons with derivation.	Understand	AME525.01
9	Derive an expression for Einstein's derivation of the blackbody radiation.	Remember	AME525.01
10	Summarize the history of solar energy utilization. State merits and demerits.	Remember	AME525.02
11	Explain various approaches of utilization of solar energy, explain merits and applications.	Understand	AME525.01

12	Explain the relationship between radiation field energy density and radiation spectrum.	Understand	AME525.01
13	Explain radiation spectrum in brief detail with sketch and how radiation is basis of solar energy.	Remember	AME525.02
14	Summarize the photoelectric effect, with a neat sketch, state how emission of electrons or other free carriers, “when light falls on a material.	Remember	AME525.02
15	Explain the phenomenon of black body radiation, with derivation and neat sketches.	Understand	AME525.01
16	Derive black body formula for black body radiation.	Understand	AME525.01
17	Summarize various approaches of utilization of solar energy, merits, demerits and applications.	Remember	AME525.02
18	Discuss the basics of solar energy, “how sun is source of all other energies”	Remember	AME525.01
19	Derive Stefan-Boltzman constant for radiation of body taking ambient temperature 300C.	Understand	AME525.01
20	Explain wein’s displacement law. So that black radiation curve for different temperature peaks at a wavelength inversely proportional to temperature.	Understand	AME525.02

Part - C (Problem Solving and Critical Thinking Questions)

1	A Green light has a wavelength of 525 nm. Determine the energy for the green light in joules.	Understand	AME525.02
2	A bulb of 60 Watt has area of 0.002 m ² . If it has emissivity of 0.76, what would be its temperature?	Understand	AME525.01
3	A black body emits some energy by a surface. Calculate the energy emitted by surface if it is at temperature 320 K.	Understand	AME525.01
4	Explain about sun spectrum. Also discuss in detail that the extraterrestrial and terrestrial oxidation falling on the earth.	Understand	AME525.02
5	A bulb of 40 Watt has area of 0.004 m ² . If it has emissivity of 0.8, what would be its temperature	Understand	AME525.01

UNIT - II

ORIGIN OF SOLAR ENERGY, TRACKING SUNLIGHT AND ATMOSPHEREIC INTERACTION

Part – A (Short Answer Questions)

S.No	QUESTION	Blooms Taxonomy level	Course Learning Outcomes
1	Define solar constant.	Remember	AME525.03
2	List out measurements of solar constant.	Understand	AME525.04
3	Explain the structure of the sun.	Understand	AME525.03
4	Discuss origin of solar energy.	Understand	AME525.03
5	Explain the rotation and orbital motion of the earth around the sun.	Understand	AME525.04
6	Define solar time.	Remember	AME525.03
7	Explain sidereal time.	Remember	AME525.03
8	Explain universal standard time.	Remember	AME525.04
9	Discuss about local standard time.	Remember	AME525.03
10	Derive equation of time.	Remember	AME525.03
11	Explain intensity of sunlight on an arbitrary surface.	Remember	AME525.04
12	Discuss interaction with the atmosphere.	Remember	AME525.03
13	Explain absorption of the molecules.	Remember	AME525.03

14	Define air mass, How it effects	Remember	AME525.04
15	Explain Rayleigh scattering in detail.	Remember	AME525.03
16	Explain scattering phenomenon, classify types of scattering.	Remember	AME525.03
17	Explain direct and scattered sunlight.	Remember	AME525.04
18	Define direct scattering.	Remember	AME525.03
19	Explain about scattered sunlight.	Understand	AME525.03
20	Explain parameters of the sun.	Remember	AME525.04
Part - B (Long Answer Questions)			
1	Explain basic parameters of the sun.	Remember	AME525.03
2	Briefly discuss about the structure of the sun with a neat sketch.	Understand	AME525.04
3	Explain the measurement of the solar constant.	Understand	AME525.03
4	Discuss the origin of solar energy.	Understand	AME525.03
5	Explain orbital motion of the earth around the sun with a neat sketch.	Understand	AME525.04
6	Briefly explain about solar time and sidereal time.	Remember	AME525.03
7	Explain equation of time with a neat sketch.	Remember	AME525.03
8	Differentiate between solar time and sidereal time.	Remember	AME525.03
9	Briefly explain about universal standard time and local standard time.	Remember	AME525.04
10	Explain Rayleigh scattering, why sun looks as blue in day and red in evening.	Remember	AME525.03
11	Differentiate between standard time and local standard time.	Remember	AME525.03
12	Explain intensity of sunlight on an arbitrary surface at any time with a neat sketch.	Remember	AME525.04
13	Briefly explain air mass and Rayleigh scattering.	Remember	AME525.03
14	Discuss about direct and scattered sunlight with a neat sketch.	Remember	AME525.03
15	Explain rotation of earth around the earth, how seasons are formed.	Remember	AME525.03
16	Explain the structure of sun, the origin of solar energy with neat sketches.	Remember	AME525.04
17	Differentiate between direct sunlight and scattered sunlight.	Remember	AME525.03
18	Explain the concept of air mass with neat sketches	Remember	AME525.03
19	Explain solar time, side real time, universal standard time, local standard time in detail	Understand	AME525.04
20	Define solar constant. How measurement of solar constant. what are different ways to measure solar constant.	Remember	AME525.03
Part – C (Problem Solving and Critical Thinking)			
1	Determine the sunset hour angle and day length for Srinagar and for Port Blair, for the following dates: Dec. 23, March 22, June 23.	Understand	AME525.04
2	When it is noon as per the clock time (or Indian Standard time), what is the solar time on Jan 20th in Mumbai, (Latitude: 19° 1' N, Longitude: 72° 67' E) Kolkata (Latitude: 22° 39' N, Longitude: 88° 27' E), and Kohima (Latitude: 25° 40' N, Longitude: 94° 07' E) on Jan. 20.	Understand	AME525.03
3	What is the extraterrestrial radiation on a horizontal surface, Io at Chennai, ($\phi = 13^\circ 00' N$) during the hour 10.30 AM to 11.30 AM on Jan 15. What is the daily (for Jan 15) and the monthly (for January) average daily extraterrestrial radiation on a horizontal surface, Ho Ho	Understand	AME525.03
4	If the daily horizontal radiation for Jan 15, in the above problem has been measured to be 19.8 MJ/(m 2-day), what is the daily clearness index?	Understand	AME525.04

5	Estimate the ratio of beam radiation on a surface tilted 45° toward the south to that on a horizontal surface, if located at a latitude of 40° on March 1, a at noon, b at 3:30 pm.	Understand	AME525.03
6	Define solar constant. How measurement of solar constant. What are different ways to measure solar constant.	Understand	AME525.03
7	A space heating system is to be designed for Srinagar $\phi=34^\circ 05'$, for the month of December. Calculate the Degree days and the space heating load, if $(UA)_h = 400 \text{ W/}^\circ\text{C}$,	Understand	AME525.03
8	A space heating system is to be designed for Srinagar $\phi=34^\circ 05'$, for the month of December. Assume $\beta=500$ and $\gamma=0$ With the space heating load calculated in Problem 6, obtain the solar load fraction if the liquid based solar collectors have, $FR_{UL} = 2.63 \text{ W/m}^2 \text{ }^\circ\text{C}$ and $FR(\tau\alpha)_n=0.72$, employ a storage tank of 125 l/m^2 and has a standard heat exchanger. The collector area is 50 m^2 .	Understand	AME525.04
9	What will be the solar load fraction if air based collectors with standard flow rate have been employed, with standard storage and assume $FR_{UL} = 2.63 \text{ W/m}^2 \text{ }^\circ\text{C}$ and $FR(\tau\alpha)_n=0.72$ remain the same as the values for the liquid based collector. You may also assume 0.94	Understand	AME525.03
10	If the global radiation on a horizontal surface has been found to be $1.8 \text{ MJ/(m}^2\text{-hr)}$ for the hour 10-11 at a location of latitude 40° , on monthly mean day of January, find the clearness index.	Understand	AME525.03

UNIT-III (CIE-I)

SOLAR CELLS, PHOTOVOLTAIC BASICS

Part - A (Short Answer Questions)

S.No	QUESTION	Blooms Taxonomy Level	Course Learning Outcomes
1	Explain about PN junction.	Understand	AME525.04
2	Define space charge and internal field.	Understand	AME525.04
3	Explain quasi fermi level.	Remember	AME525.04
4	Define Shockley diode equation.	Understand	AME525.04
5	Enumerate the structure of solar cell	Understand	AME525.04
6	Derive solar cell equation.	Understand	AME525.04
7	Explain the fill factor and maximum power.	Understand	AME525.04
8	Discuss various electron hole pair recombination mechanisms.	Understand	AME525.04
9	Explain crystalline silicon solar cell.	Remember	AME525.04
10	Why silicon is solar cell material. Discuss.	Understand	AME525.04
11	Define CIGS solar cell.	Remember	AME525.04

Part – B (Long Answer Questions)

1	Explain quasi fermi levels with a neat sketch.	Understand	AME525.04
2	Differentiate between dye sensitized solar cells and organic solar cells.	Understand	AME525.04
3	Explain formation of a p-n junction with a neat sketch.	Understand	AME525.04
4	Derive the solar cell equation and explain fill factor and maximum power.	Understand	AME525.04
5	Briefly explain various electron hole pair recombination mechanisms.	Understand	AME525.04
6	Explain thin film solar cells and list out the advantages of thin film solar cells.	Understand	AME525.04

7	Briefly explain about cte and a silicon tandem solar cell.	Understand	AME525.04
8	Differentiate between silicon tandem solar cells and dye sensitized solar cells.	Understand	AME525.04
9	Briefly describe crystalline silicon solar cells with a neat sketch.	Understand	AME525.04
10	Explain solar cell with a neat sketch and classify the solar cells.	Understand	AME525.04
11	Differentiate between silicon tandem solar cells and organic solar cells.	Remember	ME525.05
Part – C (Problem Solving and Critical Thinking)			
1	A 1 cm^2 silicon solar cell has a saturation current of 10^{-12} A and is illuminated with sunlight yielding a short-circuit photocurrent of 25 mA . Calculate the solar cell efficiency and fill factor.	Understand	AME525.04
2	For a silicon solar cell with $m=12.7$ and $n=1.14$, find the fill factor.	Understand	AME525.04
3	Find m and n when current density at 0.441 V is 63.0 mAcm^{-2} and at 0.405 V is 54.9 mAcm^{-2} . Assume the open circuit voltage and short circuit current density to be constant at 0.9 V and 1.5 mAcm^{-2} .	Understand	AME525.04
4	What is a p-n junction diode? Explain formation of P-N Junction diode with neat sketch.	Understand	AME525.04
UNIT-III (CIE-II)			
SOLAR CELLS, PHOTOVOLTAIC BASICS			
Part - A (Short Answer Questions)			
S.No	QUESTION	Blooms Taxonomy Level	Course Learning Outcomes
1	Explain structure and working of solar cell.	Understand	AME525.05
2	Define electrical and behavior of solar cells.	Remember	AME525.05
3	Summarize cell properties.	Understand	AME525.06
4	Explain cell design and steps involved.	Remember	AME525.05
5	Explain photovoltaic cell interconnection.	Understand	AME525.06
6	Discuss about module fabrication.	Understand	AME525.05
7	Explain solar cell materials.	Understand	AME525.05
8	Summarize pv modules.	Remember	AME525.06
9	Discuss on load estimation of photovoltaic cell.	Understand	AME525.05
10	What is the purpose of a pv array.	Remember	AME525.05
Part – B (Long Answer Questions)			
1	Explain structure and working of solar cell with a neat sketch.	Understand	AME525.04
2	Explain briefly electrical properties of solar cells and list out the advantages of solar cells.	Remember	AME525.04
3	Explain briefly solar cell properties and design, merits, demerits and applications.	Understand	AME525.04
4	Explain the properties and design of solar cell with a neat sketch.	Understand	AME525.04
5	Briefly explain photo voltaic modules and array.	Understand	AME525.04
6	Discuss the Photo Voltaic cell interconnection with a neat sketch.	Remember	AME525.04
7	Briefly explain photo voltaic cell with a neat sketch and list out the advantages of photo voltaic cell.	Understand	AME525.04
8	Explain the properties of solar material and design of solar cell with a neat sketch.	Remember	AME525.04

Part – C (Problem Solving and Critical Thinking)			
1	Write the properties of solar cell and give the efficiency comparison of various types of solar cells.	Understand	AME525.04
2	Explain with a neat sketch protection techniques used for solar pv system.	Remember	AME525.04
3	Explain structure and working of solar cell with a neat sketch.	Understand	AME525.04
4	Explain briefly electrical properties of solar cells and list out the advantages of solar cells.	Remember	AME525.04
5	Explain briefly solar cell properties and design, merits, demerits and applications.	Understand	AME525.04
6.	A 1 cm ² silicon solar cell has a saturation current of 10-12 A and is illuminated with sunlight yielding a short-circuit photocurrent of 25 mA. Calculate the solar cell efficiency and fill factor.	Remember	AME525.04
UNIT-IV			
SOLAR ENERGY			
Part – A (Short Answer Questions)			
S.No	QUESTION	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the solar radiation	Understand	AME525.11
2	Explain solar radiation measurements.	Remember	AME525.12
3	Discuss about solar thermal flat plate collector.	Understand	AME525.13
4	Define concentrating collector.	Remember	AME525.12
5	List solar thermal applications.	Understand	AME525.13
6	Explain in detail about solar thermal power plant.	Remember	AME525.14
7	Explain principle of photovoltaic conversion of solar energy.	Understand	AME525.13
8	Classify the types of solar cells.	Remember	AME525.14
9	Summarize the photovoltaic applications.	Understand	AME525.14
10	Explain solar heating process.	Remember	AME525.14
11	Discuss solar cooling process.	Understand	AME525.13
12	Summarize desalination process.	Remember	AME525.14
13	Explain solar drying process.	Understand	AME525.14
14	Summarize photovoltaic applications.	Remember	AME525.13
15	Explain working of a battery charger.	Understand	AME525.15
16	Summarize solar street lightening.	Remember	AME525.14
17	Explain solar water pumping.	Understand	AME525.14
18	What is net metering. How it works.	Remember	AME525.13
19	Discuss solar pv power plant.	Understand	AME525.14
20	Summarize net metering concept.	Remember	AME525.14
Part – B (Long Answer Questions)			
1	Explain solar radiation at the earth surface, how solar radiation is measured, what are measurements instruments used	Understand	AME525.11
2	Describe the performance of a typical solar PV power plant, with a typical sketch, state applications.	Understand	AME525.12
3	Explain the construction of solar thermal power plants.	Remember	AME525.13
4	State and explain elements of Low temperature thermal power plant using solar panel.	Remember	AME525.12

5	Explain concentrating collectors with neat sketch.	Understand	AME525.13
6	Describe the performance of a solar heating, with a typical sketch, state applications.	Understand	AME525.14
7	Describe the performance of a typical solar cooling, with a typical sketch, state applications.	Understand	AME525.13
8	Describe the performance of a typical desalination, with a typical sketch, state applications.	Remember	AME525.14
9	Describe the performance of a typical solar drying, with a typical sketch, state applications.	Remember	AME525.14
10	Describe the performance of a typical solar cooking, with a typical sketch, state applications.	Understand	AME525.14
11	Explain photovoltaic applications battery charger with a neat sketch, with a circuit diagram, what is electrical output generation.	Understand	AME525.13
12	Explain photovoltaic applications domestic lightening with a neat sketch, with a circuit diagram, what is electrical output generation.	Understand	AME525.14
13	Explain photovoltaic applications water pumping with a neat sketch, with a circuit diagram, what is electrical output generation.	Understand	AME525.14
14	Explain photovoltaic applications street lightening with a neat sketch, with a circuit diagram, what is electrical circuit diagram.	Understand	AME525.13
15	Explain about solar thermal flat plate collector, discuss difference between flat plate and parabolic collector.	Remember	AME525.15
16	Justify estimation of average solar radiation, Explain maintenance of concentrated solar power plant.	Remember	AME525.14
17	Write down the only features of the power obtained from the solar PV.	Understand	AME525.14
18	Explain battery charger with a circuit diagram, Write down features required of a battery for PV power plant.	Understand	AME525.13
19	Explain maintenance of concentrated solar power plant, Write the types of PV solar cell, classification of solar cells.	Understand	AME525.14
20	Discuss how solar radiation at the earth surface is measured, list out the solar radiation measurements.	Remember	AME525.15
Part – C (Problem Solving and Critical Thinking)			
1	Explain the need, types and constructional details of solar thermal energy storage system.	Understand	AME525.11
2	Explain solar radiation at earth surface, How estimation of average radiation is calculated.	Understand	AME525.12
3	Discuss principle of photovoltaic conversion of solar energy and state applications of photovoltaic applications.	Understand	AME525.13
4	Explain about solar pv power plant, with a neat sketch, discuss the thermal efficiency of the plant.	Understand	AME525.12
5	Explain about solar thermal power plant, with a neat sketch, discuss the thermal efficiency of the plant.	Understand	AME525.13
6	Explain about concentrating collectors, Write down the only features of the power obtained from the solar PV.	Understand	AME525.14
7	Explain the principle of photovoltaic conversion of solar energy Write the types of PV solar cell.	Understand	AME525.13
8	Explain net metering concept, explain solar pv power plant.	Understand	AME525.14
9	Explain about solar thermal power plant, with a neat sketch, discuss the efficiency of the plant.	Understand	AME525.14
10	Explain about battery charger, with a neat sketch, discuss the thermal efficiency of the plant.	Understand	AME525.11

UNIT-V			
CONCENTRATION OF SOLAR ENERGY, ENERGY STORAGE			
Part - A (Short Answer Questions)			
S. No	QUESTION	Blooms Taxonomy Level	Course Learning Outcomes
1	Discuss about three types of imaging optics.	Understand	AME525.13
2	Explain collectors. Classify them.	Remember	AME525.15
3	Summarize central receiver.	Remember	AME525.14
4	Explain heliostat working in concentration of solar energy.	Remember	AME525.15
5	Discuss parabolic dish concentrator with on axis tracking.	Understand	AME525.15
6	Explain sterling engine cycle.	Understand	AME525.13
7	Summarize rankine engine cycle.	Understand	AME525.15
8	Explain solar photo voltaic with concentration.	Understand	AME525.14
9	Discuss “solar energy storage is to be required”. Justify.	Understand	AME525.15
10	Explain the principle of chemical energy storage.	Understand	AME525.13
11	Summarize thermal energy storage.	Remember	AME525.14
12	Explain thermal flywheels.	Remember	AME525.15
13	Explain briefly about compressed air.	Remember	AME525.13
14	Discuss about rechargeable batteries.	Understand	AME525.15
15	State types of solar energy collector	Understand	AME525.14
16	Explain heliostat collector.	Understand	AME525.14
17	Explain parabolic trough collector	Remember	AME525.15
18	Compare lead acid and nickel cadmium batteries	Understand	AME525.13
19	Give classification of solar energy collectors.	Understand	AME525.15
20	Write down features required of a battery for PV power plan	Understand	AME525.14
Part - B (Long Answer Questions)			
1	Explain about various convertors used for storage system.	Remember	AME525.11
2	Explain the economic aspects of pv systems. Also explain how pv systems are usually rated,	Understand	AME525.13
3	Explain the necessity of storage of solar energy.	Understand	AME525.15
4	Discuss about solar photovoltaic with concentration.	Remember	AME525.14
5	Explain about chemical energy storage, specify merits of chemical energy storage over solar energy.	Remember	AME525.15
6	Summarize on thermal energy storage process in detail with a neat sketch	Understand	AME525.15
7	Explain how imaging optics is useful for concentration of solar energy.	Understand	AME525.13
8	Discuss the types of collectors explain about trough collector in detail	Remember	AME525.15
9	Discuss the types of collectors explain about trough collector in detail	Remember	AME525.14
10	Explain about thermal flywheels in detail, specify applications in energy storage.	Understand	AME525.15
11	Discuss about trough collector in detail, Discuss in detail the performance of typical solar pv power plant.	Understand	AME525.13
12	Write down features required of a battery for PV power plant.	Remember	AME525.14

13	List out the types of batteries for solar PV system.	Remember	AME525.15
14	Explain the construction of solar thermal power plants.	Understand	AME525.13
15	Explain power quality of concentrated solar power plant.	Understand	AME525.15
16	Compare lead acid and nickel cadmium batteries. Discuss lead acid or nickel cadmium batteries are better.	Remember	AME525.14
17	Explain parabolic trough collector with a neat sketch.	Remember	AME525.14
18	Explain types of imaging optics. Explain paraboloid type point focusing collector.	Understand	AME525.15
19	Explain heliostat collector.	Understand	AME525.14
20	Explain lead acid battery for solar PV system, Write advantages and disadvantages of nickel-cadmium battery.	Remember	AME525.15
Part – C (Problem Solving and Critical Thinking)			
1	Explain battery charger circuit. With a circuit diagram, write down steps involved in how charging occurs.	Remember	AME525.15
2	Explain about convertors used for various storage systems with neat sketches.	Understand	AME525.14
3	Explain collectors in detail, Discuss why parabolic dish concentrator with on axis tracking is better than linear collectors.	Understand	AME525.15
4	Summarize necessity of storage of solar energy, specify merits, demerits and applications in detail.	Remember	AME525.14
5	Explain the solar thermal electricity using stirling engine. With a neat sketch.	Remember	AME525.15

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