INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**ENERGY FROM WASTE**
Course Code	:	**AEE551**
Program	:	**B.Tech**
Semester	:	**VII**
Branch	:	**Mechanical Engineering**
Section	:	**B**
Academic Year	:	**2019 – 2020**
Course Faculty	:	**Mr. B D Y Sunil, Assistant Professor, ME**

COURSE OBJECTIVES:

The course should enable the students to:	
I	Understand the principles associated with effective energy management and to apply these principles in the day to day life.
II	Develop insight into the collection, transfer and transport of municipal solid waste.
III	Explain the design and operation of a municipal solid waste landfill.
IV	Evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities and device key processes involved in recovering energy from wastes.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	What are different types of waste?	Waste is unwanted materials (or) unusable materials which are discarded after primary use and of no use. Types of waste are solid, wet, e-waste, biomedical, and hazardous.	Remember	CO 1	CLO 2	AEE551.02
2	Define municipal solid waste?	Municipal solid waste (MSW) is commonly known as garbage or trash in united states and rubbish in united kingdom it is a waste item consisting of everyday items that are discarded by public.	Remember	CO 1	CLO 1	AEE551.01
3	Explain Municipal solid waste management?	Management of solid waste generally refers to management of waste from residential societies, public places, commercial buildings, hospitals and streets and other institutions.	Remember	CO 1	CLO 3	AEE551.03

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4	Summarize physical properties of municipal solid waste?	Physical properties of municipal solid waste are 1) moisture content, 2) specific gravity, 3) particle size, 4)permeability (or) hydraulic conductivity.	Remember	CO 1	CLO 2	AEE551.02
5	Summarize chemical properties of municipal solid waste?	Methods to determine chemical content in municipal solid waste are proximate analysis-this is the method to determine moisture content, fixed carbon and volatile material, ultimate analysis- In this method C,H,N and S are converted into oxides and then seperated. Fusing point of ash- content of ash can be found after burning of waste, lignocellulogic composition-this method is used to find cellulose, hemicelluloses components in grass, bagasse and corn stoves.	Summarize chemical properties of municipal solid waste?	CO 1	CLO 2	AEE551.02
6	Summarize biological properties of municipal solid waste?	Biological properties of municipal solid waste are biodegradable and compostable wastes and effect on human health.	Summarize biological properties of municipal solid waste?	CO 1	CLO 4	AEE551.04
7	Discuss waste collection methods?	Primary and secondary collection. In primary collection the vehicles used are carts and trucks. In secondary collection, the vehicles used are heavy trucks, compactor trucks.	Discuss waste collection methods?	CO 1	CLO 3	AEE551.03
8	Define transfer station?	Transfer station is a place where the waste is transferred from primary and secondary vehicles and then sent to landfill and disposal area. This station reduces the cost of waste collection by using larger trucks instead of using smaller trucks to travel to land fill area.	Define transfer station?	CO 1	CLO 3	AEE551.03
9	Discuss the concept waste minimization?	Waste minimization is the process of reducing waste at source by proper packing and manufacturing of the products , selective use of recyclable waste.	Discuss the concept waste minimizatio n?	CO 1	CLO 3	AEE551.03
10	Summarize waste treatment methods?	Various waste treatment methods are physical, thermal, chemical, biological treatments.	Remember	CO 1	CLO 3	AEE551.03
11	Define aerobic composting?	Microbial decomposition of organic material in the presence of air (oxygen) and water.	Remember	CO 1	CLO 4	AEE551.04
12	Define incineration?	It is the process of burning the waste without energy recovery to either reduce the volume of waste and / or destroy its infectious properties. More and more incinerators now	Remember	CO 1	CLO 4	AEE551.04

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		recover waste in the form of electricity or thermal energy. The by-products of incineration (bottom ash and fly ash) are processed with a view to controlling the impacts of this activity both on humans and on the environment.				
13	Discuss about furnace type and objectives?	A furnace is essentially a thermal enclosure and is employed to process raw materials at high temperatures both in solid state and liquid state. Several industries like iron and steel making, non ferrous metals production, glass making, manufacturing, ceramic processing, calcinations in cement production etc. employ furnace. The principle objectives are a) To utilize heat efficiently so that losses are minimum, and b) To handle the different phases (solid, liquid or gaseous) moving at different velocities for different times and temperatures such that erosion and corrosion of the refractory are minimum.	Remember	CO 1	CLO 4	AEE551.04
14	Summarize various techniques on disposal of medical waste pharmaceutical waste.	Methods for sterilization of medical waste / pharmaceutical waste treatment are incineration, autoclave, hydro clave, chemical disinfecting.	Remember	CO 1	CLO 4	AEE551.04
15	Discuss measures to mitigate environmental effects due to incineration?	In order to improve the process and incineration and to minimize environmental impacts, in particular atmospheric emissions, it is proposed to replace single use containers with multiple use containers.	Remember	CO 1	CLO 4	AEE551.04
UNIT-II						
1	Define term landfill?	Land fill is a site for the disposal of waste materials by burial. It is the oldest form of waste treatment.	Remember	CO 2	CLO 6	AEE551.06
2	Explain land fill method?	The trench method is good in areas where there is relatively little waste, low groundwater, and the soil is over 6 ft (1.8 m) deep. The area method is usually used to dispose of large amounts of solid waste. In the trench method, a channel with a typical depth of 15 ft (4.6	Remember	CO 2	CLO 4	AEE551.04

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		m) is dug, and the excavated soil is later used as a cover over the waste. Grading in the trench method must accommodate the drain-off of rainwater. Another consideration is the type of subsurface soil that exists under the topsoil. Clay is a good source of soil because it is nonporous. Weather and the amount of time the landfill will be in use are additional considerations.				
3	Discuss concept land fill gas?	Landfill gas is created during the anaerobic decomposition of organic substances in municipal solid waste (MSW) and commercial and industrial (C&I) wastes. Depending upon the landfill design and its management, as well as waste composition, compaction, moisture and several other factors, thousands of landfills are available worldwide to collect and utilize this valuable renewable energy source for power generation. If landfill gas is allowed to escape to atmosphere, methane contained within it is a powerful greenhouse gas, 21 times more so than carbon dioxide. Therefore, its prevention of escape to atmosphere and its utilization as a renewable fuel source is a win-win situation.	Remember	CO 2	CLO 6	AEE551.06
4	Listout landfill types?	There are two types of landfills namely, 1) Natural attenuation landfill and 2) Containment landfill. Natural attenuation landfill is similar to what has been discussed in the previous paragraph where there is no provision below the wastes to minimize the migration of harmful contaminants. The unsaturated subsurface below the wastes naturally attenuate harmful contaminants before it reaches ground water. It is presumed that the contaminants reaching ground water will be well within the permissible limit, even though in most of the cases it would not be. For the same reason, these types of landfills are not preferred in	Remember	CO 2	CLO 4	AEE551.04

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		spite of its simplicity.				
5	Discuss sitting consideration?	Considerations for site include public opinion, traffic patterns and congestion, climate, zoning requirements, availability of cover material and liner as well, high trees or buffer in the site perimeter, historic buildings, and endangered species, wetlands, and site land environmental factors, speed limits, and underpass limitations, load limits on roadways, bridge capacities, and proximity of major roadways, haul distance, hydrology and detours.	Remember	CO 2	CLO 6	AEE551.06
6	Discuss site selection of land fill	This requires the development of a working plan – a plan, or a series of plans, outlining the development and descriptions of site location, operation, engineering and site restoration	Remember	CO 2	CLO 6	AEE551.06
7	Discuss various methods of land fill	Trench and area methods, along with combinations of both, are used in the operation of landfills. Both methods operate on the principle of a "cell," which in landfills comprises the compacted waste and soil covering for each day.	Remember	CO 2	CLO 6	AEE551.06
8	Summarize preliminary design of landfills?	A hazardous waste landfill must fulfill the following design requirements: - 1. Double liner 2. Double leach ate collection removal systems 3. Leak detection system 4. Monitoring storm water run-on and run-off - Monitoring wind dispersal Absence of liquid wastes 5. Cover system in place	Remember	CO 2	CLO 6	AEE551.06
9	Discuss land fill gas composition?	Landfill gas composition and production rates are primarily affected by the waste that has been deposited in the landfill site. MSW contains 150-250 kg of organic carbon per tonne which micro-organisms convert to landfill gas via anaerobic processes. The gas formation is influenced by a number of factors such as waste composition, landfill storage height and density, air temperature, atmospheric pressure and precipitation	Remember	CO 2	CLO 4	AEE551.04

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		levels.				
10	What is leacheate?	Leachate is the landfill waste that dissolves many compounds that contain pollutants from both organic substances and heavy metal origin.	Remember	CO 2	CLO 6	AEE551.06
11	Analysis characteristics of landfill leacheates	Landfill Leachates consist of soluble organic and inorganic compounds as well as suspended particles. Depending on weather leachate flow can increase (during rainy season) or decrease (during dry/summer season). The landfill leachate discharge may lead to serious environmental problems. Leachate may percolate through landfill liners and subsoil causing pollution of ground water and surface waters resources.	Remember	CO 2	CLO 6	AEE551.06
12	Discuss landfill leacheate movement?	Solid-waste management facilities such as landfills can affect the quality of underlying groundwater and surface water.	Remember	CO 2	CLO 6	AEE551.06
13	Discuss control of landfill?	Leachate Control It should be noted that if all infiltration is excluded and the solid waste kept dry, biodegradation by bacteria, fungi, and other organisms will cease and the solid waste will be preserved in its original state. The maintenance of an optimal amount of moisture in the fill, as in controlled composting (an aerobic process), is necessary for biodegradation (an anaerobic process in a landfill), methane production, final stabilization, and possible future recycling of the solid waste or reuse of the site.	Remember	CO 2	CLO 4	AEE551.04
14	Advantages of landfill gas recovery?	The waste deposited in a landfill gets subjected, over a period of time, to anaerobic conditions and its organic fraction gets slowly volatilized and decomposed, leading to production of landfill gas which contains a high percentage of methane (about 50%). Advantages of land fill gas recovery are: 1. Reduced GHG emissions; 2. Low cost means for waste disposal; and 3. The gas can be	Remember	CO 2	CLO 6	AEE551.06

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		utilized for power generation or as domestic fuel				
15	Discuss environmental monitoring system for land fill gases	The gas monitoring plan should also be specific to the gas measuring device, and the measuring device operating manual should be incorporated by reference into the site gas monitoring plan. Methane should be controlled because it can migrate away from a landfill and become an environmental and safety hazard.	Remember	CO 2	CLO 6	AEE551.06
UNIT-III						
1	Define Bioenergy?	Bioenergy consists of solid, liquid, or gaseous fuels. Liquid fuels can be used directly in the existing road, railroad, and aviation transportation network stock, as well as in engine and turbine electrical power generators.	Remember	CO 3	CLO 8	AEE551.08
2	Explain bio-mass conversion?	Biomass power technologies convert renewable biomass fuels to heat and electricity using processes similar to those employed with fossil fuels. At present, the primary approach for generating electricity from biomass is combustion direct-firing. Combustion systems for electricity and heat production are similar to most fossil-fuel fired power plants. The biomass fuel is burned in a boiler to produce high-pressure steam.	Remember	CO 3	CLO 8	AEE551.08
3	Explain bio-chemical conversion?	In biochemical conversion – plants are the main feedstock. Plants are made up of mostly these three parts – hemicellulose, cellulose, and lignin. Cellulose is protected in a sheath of the other two so goes through a form of pretreatment using acid or catalysts.	Remember	CO 3	CLO 8	AEE551.08
4	Define anaerobic digestion?	Anaerobic digestion is a commercially proven technology and is widely used for recycling and treating wet organic waste and waste waters. It is a type of fermentation that converts organic material into biogas, which mainly consists of methane (approximately 60%) and carbon dioxide (approximately 40%) and is	Remember	CO 3	CLO 8	AEE551.08

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		comparable to landfill gas.				
5	What is biodiesel?	Biodiesel can be used in pure form or may be blended with petroleum diesel at any concentration for use in most modern diesel engines. Biodiesel is raw vegetable oil transformed, treated, and standardized through chemical processes.	Remember	CO 3	CLO 5	AEE551.05
6	What is Biochar?	Biochar is a fine-grained charcoal high in organic carbon and largely resistant to decomposition. Biochar is produced by heating biomass in the absence (or under reduction) of air, or pyrolysis.	Remember	CO 3	CLO 7	AEE551.07
7	Define transesterification ?	In transesterification, biodiesel is formed. Takes the place of petroleum or used as a mix. Takes vegetable oil, animal fat, or grease and turns it into a fatty acid methyl ester by taking the alkoxy group and replacing it with the alcohol. Usually this process is base or acid catalyzed.	Remember	CO 3	CLO 7	AEE551.07
8	Summarize sources of energy generation using bio chemical conversion?	Biochemical conversion entails breaking down biomass to make the carbohydrates available for processing into sugars, which can then be converted into biofuels and bio products through the use of microorganisms and catalysts	Remember	CO 3	CLO 8	AEE551.08
9	Summarize step by step process of energy conversion using bio chemical?	Step by step process of bio chemical conversion : 1. Feedstock Supply, 2. Pretreatment, 3. Hydrolysis, 4. Biological Conversion, 5. Chemical Conversion, 6. Product Recovery, 7. Product Distribution and 8. Heat & Power	Remember	CO 3	CLO 8	AEE551.08
10	Discuss anaerobic digestion of sewage	Anaerobic digestion of sewage is a commercially proven technology and is widely used for recycling and treating wet organic waste and waste waters.	Remember	CO 3	CLO 4	AEE551.04
11	Define hydrolysis?	Hydrolysis is a enzymes (or other catalysts) enable the sugars within cellulose and hemicellulose in the pretreated material to be separated and released over a period of several days.	Remember	CO 3	CLO 4	AEE551.04
12	Explain direct combustion of	It is process of oxidation in single stage that is combustion	Remember	CO 3	CLO 4	AEE551.04

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	MSW-refuse derived solid fuel	of municipal solid waste but in case of two stage oxidation is called gasification				
13	Define enzyme primer?	Enzyme Primer 1. Enzymes are proteins that naturally enable chemical reactions in living organisms. 2. Many of these reactions break down larger molecules into smaller ones.	Remember	CO 3	CLO 8	AEE551.08
14	Define Industrial waste agro residues?	The waste generated in the industries after the products are produced such as ash ,paints and radioactive waste. In agricultural fields the waste is dry grass.	Remember	CO 3	CLO 9	AEE551.09
15	Define aerobic digestion?	This process of is also known as the biogas platform, methane, also known as natural gas, is produced. This process of decomposition uses natural consortia of microorganisms to break down biomass into its building blocks.	Remember	CO 3	CLO 5	AEE551.05
UNIT-IV						
1	Define term biogas?	Biogas is a bio-fuel produced from the anaerobic fermentation of carbohydrates in plant material or waste (food peelings or manure) by bacteria.	Remember	CO 4	CLO 8	AEE551.08
2	What is landfill gas utilization?	Landfill gas utilization is a process of gathering, processing, and treating the methane gas emitted from decomposing garbage to produce electricity, heat, fuels, and various chemical compounds.	Remember	CO 4	CLO 8	AEE551.08
3	Discuss how landfill gases are collected?	The gas must be continuously extracted under controlled conditions. Perforated tubes are drilled into the landfill body and interconnected by a pipe work system. Using a blower, the gas is sucked from the landfill. A well-designed gas collection system will flexibly capture the landfill gas from various spots and handful high temperatures, leach ate, condensates and air content – thus ensuring a cost-efficient collection as well as stable landfill gas quality. Several engineering companies specialize in this field and offer their services on a worldwide.	Remember	CO 4	CLO 8	AEE551.08

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4	Explain process of thermo chemical conversion?	Bio-renewable feed stocks can be used as a solid fuel, or converted into liquid or gaseous forms for the production of electric power, heat, chemicals, or gaseous and liquid fuels. Thermochemical conversion pro cesses include three subcategories: pyrolysis, gasification and liquefaction.	Remember	CO 4	CLO 12	AEE551.12
5	Summarize the difference between pyrolysis and gasification?	Pyrolysis is a process of subjecting a biomass feedstock to high temperatures (greater than 430 °C) under pressurized environments and at low oxygen levels. In the process, biomass undergoes partial combustion. Processes of pyrolysis result in liquid fuels and a solid residue called char, or biochar. The Biomass gasification process is the conversion by partial oxidation (i.e. more oxidizing agent than for pyrolysis but less than for complete combustion) at high temperature (>800°C) of biomass into a gas.	Remember	CO 4	CLO 14	AEE551.14
6	Discuss different types of gasifiers used in gasification.	Main classification of gasifiers: Basically there are two types of gasifiers: fixed bed and fluidized bed and further in fixed bed there are three types: up draft gasifiers, down draft gasifiers and cross draft gasifiers.	Remember	CO 4	CLO 14	AEE551.14
7	Define biomass briquettes and why do we use them?	Biomass briquettes are a biofuel substitute to coal and charcoal. Biomass briquettes are made from agricultural and forestry waste.The low density biomass(agricultural and forestry waste) is converted into high density biomass briquettes with the help of a briquetting machine that uses binder less technique, without using any type of chemical so it is 100% natural. Biomass briquettes are used instead of charcoal because they emit less carbondioxide when they are burnt.	Remember	CO 4	CLO 13	AEE551.13
8	Discuss the major raw materials used in biomass briquettes	The major raw material for biomass briquette are, Mustard Stalks, Sawdust, Rice Husk, Coffee Husk, Coir Pitch, Jute Sticks, Sugarcane Baggasse, Groundnut Shell, Cotton Stalks,	Remember	CO 4	CLO 13	AEE551.13

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		Caster Seed Shells / Stalk, Wood Chips, Bamboo Dust, Tobacco Waste, Tea Waste, maize stalks, bajra cobs, Arhar stalks, Paddy Straw, Wheat Straw, Sunflower Stalk, Palm Husk, Soyabean Husk, Veneer Residues, Barks & Straws, Leafs, Pine Niddle, Seeds Cases etc.				
9	What are the techniques used to make biomass briquettes.	Mainly two techniques are available for making briquetted fuel from agro wastes. 1. Pyrolysed briquetted fuel: 2. Direct compaction briquetted fuel:	Remember	CO 4	CLO 13	AEE551.13
10	List out the biomass briquetting machines available?	Biomass briquetting machines: 1. Jumbo 90 briquetting machine. 2. Super 70 briquetting machine. 3. Supreme 70 briquetting machine. 4. Briquetting crusher machine.	Remember	CO 4	CLO 13	AEE551.13
11	What are the advantages of biomass briquetting?	Advantages: 1. Biomass briquette plant is made from green waste and industrial waste. So, it is the clean and renewable. 2. When the process of making briquette is going on, it does not emit any harmful gases. 3. Easy availability of biomass and other raw material. 4. From this plant, biomass is converted into useful biomass briquettes. It is also known as white coal. 5. Government also supports to this project due to its eco friendly features and also gives subsidy to purchase this briquette plant.	Remember	CO 4	CLO 13	AEE551.13
12	List out the applications of biomass briquettes?	Biomass Briquette are widely used for any type of thermal application like steam generation in boilers, in furnace & foundries (It can be used for metal heating & melting where melting point is less than 1000d/cel.), for heating purpose	Remember	CO 4	CLO 13	AEE551.13

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		(Residential & Commercial Heating for winter, heating in Cold areas and Hotels, Canteens, Cafeterias and house hold kitchen appliances etc), drying process and in gasification plant replacing conventional solid fuels like Coal and Firewood and liquid fuels like Diesel, Kerosene, Furnace Oil (FO), etc.				
13	Discuss environmental benefits of thermo chemical conversion.	Thermochemical conversion processes such as gasification, pyrolysis and incineration can remove materials from the solid waste stream and can also create: 1. Liquid fuels such as biodiesel, ethanol and oil. 2. Electricity, heat and steam from combustible gases such as methane. 3. Chemicals and consumer products from oils and syngas. 4. Activated carbon for the food processing industry	Remember	CO 4	CLO 12	AEE551.12
14	Differentiate between producer gas and syngas?	Producer gas is generated in the low temperature gasification process (< 1000°C) and contains CO, H2, CH4, CxHy, aliphatic hydrocarbons, benzene, toluene, and tars (besides CO2, H2O, and N2 in case of gasification in air). H2 and CO typically contain only ~50% of the energy in the gas, while the remainder is in CH4 and higher (aromatic) HCs. Syngas is produced by high temperature (above 1200°C) or catalytic gasification. Under these conditions the biomass is completely converted into H2 and CO (besides CO2, H2O, and N2 in case of gasification in air). Syngas is chemically similar to that derived from fossil sources. This gas can also be made from producer gas by heating the thermal cracking or catalytic reforming.	Remember	CO 4	CLO 14	AEE551.14
15	Discuss the advantages of	Produces a more convenient easily controllable form of	Remember	CO 4	CLO 14	AEE551.14

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	biomass gasification.	cleaner fuel for both thermal energy and electricity generation, and provides a mean to reduce or remove conventional fossil fuels. Gasification gives biomass the flexibility to fuel a wide range of electricity generation systems: gas turbines, fuel cells, and reciprocating engines. A wide variety of biomass materials can be gasified, many of which would be difficult to burn otherwise. Gasification offers one means of processing waste fuels, many of which can be problematic. Gasification has the potential of reducing emission of pollutants and greenhouse gases per unit energy output. Projected process efficiencies are higher than the direct combustion systems and comparable with fossil systems				
UNIT-V						
1	What is E-waste in global context?	E-waste comprises of waste electronics goods which are not fit for their originally intended use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc	Remember	CO 5	CLO 17	AEE551.17
2	Discuss different sources of E-waste.	1. Solder in printed circuit boards, glass panels, and gaskets in computer monitors. 2. Chip resistors and semi-conductors 3. Relays and switches, and printed circuit boards. 4. Galvanized steel plates and decorator or hardener for steel housing. 5. Cabling and computer housing. 6. Electronic equipment and circuit boards. 7. Copper wires, Printed circuit board tracks. 8. Nickel–cadmium rechargeable batteries. 9. Lithium-ion battery and mother board.	Remember	CO 5	CLO 17	AEE551.17
3	Listout types of treats from E-	Types of E-waste : 1. Dispose issue	Remember	CO 5	CLO 17	AEE551.17

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	waste.	2. Health and environmental issue. 3. Illegal dumping. 4. Imports from Europe and America.				
4	What are the environmental concerns of E-waste?	1. Pollution of ground water 2. Acidification of soil 3. Air pollution 4. E-Waste accounts for 40% of lead and 75% of heavy metals in landfills.	Remember	CO 5	CLO 18	AEE551.18
5	What are the health hazards of E-waste?	1. DNA damage 2. Lung cancer. 3. Damage to heart, liver and spleen. 4. Chronic damage to the brain. 5. Asthmatic bronchitis.	Remember	CO 5	CLO 18	AEE551.18
6	Discuss the current status of E-waste management.	For the recycling of e-waste, India heavily depends on the unorganized sector as only a handful of organized e-waste recycling facilities are available. Over 95% of the e-waste is treated and processed in the majority of urban slums of the country, where untrained workers carry out the dangerous procedures without personal protective equipment, which are detrimental not only to their health but also to the environment.	Remember	CO 5	CLO 18	AEE551.18
7	List out the reusable components in e-waste.	Plastic, metal, glass, mercury, printed circuit board, hard drives, ink and toner cartridges, batteries are the reusable products from E-Waste.	Remember	CO 5	CLO 17	AEE551.17
8	Discuss current challenges in electronic recycling industries.	E waste recycling industries face certain challenges like: 1. Exports to developing nations 2. Less valuable materials 3. Electronics are not designed for recycling and reuse. 4. Most E-waste still goes to landfills.	Remember	CO 5	CLO 17	AEE551.17
9	Discuss the process for recycling electronic waste	Collection and transportation are two of the initial stages of the recycling process, including for e-waste.After collection and transportation to recycling facilities, materials in the e-waste stream must be processed and separated into clean commodities that can be used to make new products. After the	Remember	CO 5	CLO 16	AEE551.16

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		shredding, sorting and separation stages have been executed, the separated materials are prepared for sale as usable raw materials for the production of new electronics or other products.				
10	Discuss about E-Waste legislations.	Basel convention for regulating trans- boundary movement. The hazardous waste (management and handling) rules, 1998 as amended in 2008. Municipal solid waste management and handling rules for non- toxic content. The environment protection act-biomedical wastes (M &H) rules 1998, batteries (M&H) rules 2001,etc.	Remember	CO 5	CLO 15	AEE551.15
11	List out the E-Waste management and handling rules.	Procedure and authorization of producers, dismantlers, collection agencies and recyclers. Procedure for renewal/ registration of recyclers. Liability of producers, collection agencies and recyclers. Reduction of hazardeous substances used in E-equipment.	Remember	CO 5	CLO 15	AEE551.15
12	What is global trade in hazardous waste?	The global waste trade is the international trade of waste between countries for further treatment, disposal, or recycling. Toxic or hazardous wastes are often exported from developed countries to developing countries, also known as countries of the Global South. Therefore, the burden of the toxicity of wastes from Western countries falls predominantly onto developing countries in Africa, Asia, and Latin America.	Remember	CO 5	CLO 17	AEE551.17
13	List out any five environmental protection laws.	Protection of animals and plants Planning for the use and development of land Water resource management (lakes, wetlands, rivers and oceans) Conservation of natural and cultural heritage Mining, exploration and extractive industries	Remember	CO 5	CLO 15	AEE551.15
14	What is the impact of hazardous E-	One of the most common effects of E-waste on air is through air pollution.	Remember	CO 5	CLO 18	AEE551.18

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	waste on environment?	When electronics containing heavy metals such as lead, barium, mercury, lithium (found in mobile phone and computer batteries), etc., are improperly disposed, these heavy metals leach through the soil to reach groundwater channels which eventually run to the surface as streams or small ponds of water. In this way, toxic heavy metals and chemicals from e-waste enter the "soil-crop-food pathway," one of the most significant routes for heavy metals' exposure to humans.				
15	List out measures to reduce E-waste.	Checking with the local government on laws and regulations guiding ethical and safe disposal of these waste. With the donation of electronics, some of the e-waste disposed can actually be reused. With the use of a certified E-waste recycler, one can find an ethical and safe recycler certified through the Basel Action Network (BAN), a non-profit organization.	Remember	CO 5	CLO 16	AEE551.16

Signature of the Faculty **HOD, ME**