

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	ENERGY FROM WASTE
Course Code	:	AEE551
Program	:	B.Tech
Semester	:	VII
Branch	:	Information Technology
Section	:	A
Academic Year	:	2019 - 2020
Course Faculty	:	Mr. S Srikrishnan, Assistant Professor, ME

COURSE OBJECTIVES:

The	The course should enable the students to:						
Ι	Understand the principles associated with effective energy management and to apply these principles in the day to day life.						
Π	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	СО	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

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 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, bemicelluloses components in grass, bagasse and corn stoves. Summarize biological properties of municipal solid waste? CO 1 CLO 2 6 Summarize biological properties of municipal solid waste? Biological properties of municipal solid waste are biological properties of municipal solid waste? Summarize biological properties of municipal solid waste are biological properties of municipal solid waste? CO 1 CLO 4 7 Discuss waste collection methods? Primary and secondary trucks. In secondary collection the vehicles used are carts and trucks. In secondary collection the vehicles used are heavy trucks, compactor trucks. Define transfer station? CO 1 CLO 3 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 Define transfer CO 1<	AEE551.02 AEE551.02 AEE551.04 AEE551.03
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primary and secondary vehicles station? and then sent to landfill and	THEL551.05
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	
g Discuss the Waste minimization is the Discuss the CO 1 CLO 3	AEE551.03
9 Discuss the concept waste process of reducing waste at concept	AEE331.03
minimization? source by proper packing and waste	
manufacturing of the products, minimizatio	
selective use of recyclable n?	
waste.	
10Summarize wasteVarious waste treatmentRememberCO 1CLO 3	AEE551.03
treatment methods are physical, thermal,	
methods? chemical, biological treatments.	
11Define aerobicMicrobial decompositionRememberCO 1CLO 4	AEE551.04
composting? of organic material in the	
presence of air (oxygen) and	
water. water. 12 Define It is the process of burning the Remember CO 1 CLO 4	AEE551.04
incineration? waste without energy recovery	ALL331.04
to either reduce the volume of	
waste and / or destroy its	1
infectious properties. More and	
more incinerators now	

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
01110	QUEDITON	recover waste in the form of		00	020	020 0000
		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				
12	D: 1 /	the environment.	D 1	CO 1		455551.04
13	Discuss about	A furnace is essentially a thermal enclosure and is	Remember	CO 1	CLO 4	AEE551.04
	furnace type and	employed to process raw				
	objectives?	materials at high temperatures				
		both in solid state and liquid				
		state. Several industries like		-		
		iron and steel making, non	1.1	1.1		
		ferrous metals production, glass		\sim		
		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.				
14	Summarize	Methods for sterilization of	Remember	CO 1	CLO 4	AEE551.04
	various	medical waste / pharmaceutical				
	techniques on	waste treatment are incineration,				
	disposal of	autoclave, hydro clave, chemical				100
	medical waste	disinfecting.				
	pharmaceutical				- C	
1.5	waste.			00.1	ar o t	
15	Discuss measures	In order to improve the process	Remember	CO 1	CLO 4	AEE551.04
	to mitigate	and incineration and to				
	environmental effects due to	minimize environmental impacts, in particular	1		1	
	incineration?	atmospheric emissions, it is		0		
	memeration:	proposed to replace single use		28		
		containers with multiple use		1		
		containers.		5.7		
		UNIT-II				
1	Define term	Land fill is a site for the	Demo	<u> </u>	CLOC	AEE551.06
1	landfill?	disposal of waste materials by	Remember	CO 2	CLO 6	AEE551.06
		burial. It is the oldest form				
		of waste treatment.				
2	Explain land fill	The trench method is good in	Remember	CO 2	CLO 4	AEE551.04
	method?	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				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
	<u> </u>	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	Landfill gas is created during	Remember	CO 2	CLO 6	AEE551.06
	land fill gas?	the anaerobic decomposition of	1.1			
		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			- C	
		utilization as a renewable fuel		_	-	
4	Listout londfill	source is a win-win situation.	Damamhan	CO 2	CLO 4	AEE551.04
4	Listout landfill	There are two types of landfills	Remember	CO 2	CLO 4	AEE551.04
	types?	namely, 1) Natural attenuation landfill			Sec	
		and		- 0		
		2) Containment landfill.		2.3		
		Natural attenuation landfill is		1		
		similar to what has been		5		
		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				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	D'a ini	spite of its simplicity. Considerations for site include	Du 1	<u> </u>	OLO 1	
5	Discuss sitting		Remember	CO 2	CLO 6	AEE551.06
	consideration?	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,	17. IV			
		haul distance, hydrology and				
		detours.				
6	Discuss site	This requires the development	Remember	CO 2	CLO 6	AEE551.06
	selection of land	of a working plan – a plan, or a				
	fill	series of plans, outlining the				
		development and descriptions				
		of site location, operation,				
_		engineering and site restoration		~ ~		
7	Discuss various	Trench and area methods, along	Remember	CO 2	CLO 6	AEE551.06
	methods of land	with combinations of both, are				
	fill	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.				
8	Summarize	A hazardous waste landfill must	Remember	CO 2	CLO 6	AEE551.06
Ũ	preliminary	fulfill the following design		001	0200	1111001100
	design of	requirements: -				
	landfills?	1. Double liner			- C	
	-	2. Double leach ate				e
	0	collection removal				
	0	systems			~	
	- C.	3. Leak detection system			Sec. 1	
	-7	4. Monitoring storm			1.1	
		water run-on and run-			· · · ·	
		off - Monitoring wind		9		
		dispersal Absence of		1		
		liquid wastes 5. Cover system in place				
9	Discuss land fill	Landfill gas composition and	Remember	CO 2	CLO 4	AEE551.04
2	gas composition?	production rates are primarily	Kemember	002	CLU4	ALLJJ1.04
	ous composition:	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				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	****	levels.		~ -	OT C	
10	What is	Leachate is the landfill waste	Remember	CO 2	CLO 6	AEE551.06
	leacheate?	that dissolves many compounds				
		that contain pollutants from both organic substances and				
		heavy metal origin.				
11	Analysis	Landfill Leachates consist of	Remember	CO 2	CLO 6	AEE551.06
11	characteristics	soluble organic and inorganic	Kemember	02		AEE331.00
	of landfill	compounds as well as				
	leacheates	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.				
12	Discuss landfill	Solid-waste management	Remember	CO 2	CLO 6	AEE551.06
	leacheate	facilities such as landfills can				
	movement?	affect the quality of underlying				
		groundwater and surface water.				
13	Discuss control	Leachate Control It should be	Remember	CO 2	CLO 4	AEE551.04
	of landfill?	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,			- C	
		as in controlled composting (an				
		aerobic process), is necessary			-	
		for biodegradation (an		r .		
		anaerobic process in a landfill),	1		Sec. 1	
		methane production, final			1.0	
		stabilization, and possible future recycling of the solid waste or		28		
		reuse of the site.		10		
14	Advantages of	The waste deposited in a landfill	Remember	CO 2	CLO 6	AEE551.06
	landfill gas	gets subjected, over a period of				
	recovery?	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				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		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	Remember	CO 3	CLO 8	AEE551.08
		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.		7	210	>
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 can be used in pure	Remember	CO 3	CLO 5	AEE551.05
	biodiesel?	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				
	W1 . D' 1 0	processes.	D 1	GO 0	GI 0 7	100551.05
6	What is Biochar?	Biochar is a fine-grained	Remember	CO 3	CLO 7	AEE551.07
		charcoal high in organic carbon				
	1.0	and largely resistant to				
		decomposition. Biochar is				
		produced by heating biomass in				
		the absence (or under reduction)				
7	Define	of air, or pyrolysis.	Domensher	CO 3	CLO7	AEE551.07
7	Define transesterification	In transesterification, biodiesel	Remember	003	CLO 7	AEE551.07
	?	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.				
8	Summarize	Biochemical conversion entails	Remember	CO 3	CLO 8	AEE551.08
	sources of energy	breaking down biomass to make	Temenoor	205	2100	
	generation using	the carbohydrates available for				
	bio chemical	processing into sugars, which				
	conversion?	can then be converted into			(
	50	biofuels and bio products				100
		through the use of				
	0	microorganisms and catalysts		-	0	
9	Summarize step	Step by step process of bio	Remember	CO 3	CLO 8	AEE551.08
	by step process of	chemical conversion :		1	-	
	energy	1. Feedstock Supply,			-	
	conversion using	2. Pretreatment,	/		100	
	bio chemical?	3. Hydrolysis,				
		4. Biological Conversion,			· · · · ·	
		5. Chemical Conversion,		Sec. 7		
		6. Product Recovery,		~		
		7. Product Distribution		1		
		and 8 Heat & Dower		4		
10	Diaguas	8. Heat & Power	Doment	<u> </u>	CLO 4	AEE551.04
10	Discuss anaerobic	Anaerobic digestion of sewage	Remember	CO 3	CLO 4	AEE551.04
	digestion of	is a commercially proven technology and is widely used				
	sewage	for recycling and treating wet				
	se waze	organic waste and waste waters.				
11	Define	Hydrolysis is a enzymes (or	Remember	CO 3	CLO 4	AEE551.04
11	hydrolysis?	other catalysts) enable the	Remember	005	CLU T	112231.07
		sugars within cellulose and				
		hemicellulose in the pretreated				
		material to be separated and				
		released over a period of several				
		days.				
12	Explain direct	It is process of oxidation in	Remember	CO 3	CLO 4	AEE551.04
	combustion of	single stage that is combustion				
·						

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code				
	MSW-refuse	of municipal solid waste but in								
	derived solid fuel	case of two stage oxidation is called gasification								
13	Define enzyme	Enzyme Primer	Remember	CO 3	CLO 8	AEE551.08				
	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.								
14	Define Industrial	The waste generated in the	Remember	CO 3	CLO 9	AEE551.09				
	waste agro residues?	industries after the products are produced such as ash ,paints and								
	residues?	radioactive waste. In agricultural		0						
		fields the waste is dry grass.								
15	Define aerobic	This process of is also known	Remember	CO 3	CLO 5	AEE551.05				
	digestion?	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.								
	UNIT-IV									
1	Define term	Biogas is a bio-	Remember	CO 4	CLO 8	AEE551.08				
	biogas?	fuel produced from the								
		anaerobic fermentation of								
		carbohydrates in plant material								
		or waste (food peelings or manure) by bacteria.		- 17						
2	What is landfill	Landfill gas utilization is a	Remember	CO 4	CLO 8	AEE551.08				
	gas utilization?	process of gathering,		7.						
		processing, and treating the	Contraction of the second		-					
		methane gas emitted from		r .	_					
		decomposing garbage to produce electricity, heat, fuels,	1		1					
		and various chemical		- 0	1.1					
		compounds.		1						
3	Discuss how	The gas must be continuously	Remember	CO 4	CLO 8	AEE551.08				
	landfill gases are collected?	extracted under controlled conditions. Perforated tubes are		1						
		drilled into the landfill body and	1. 1. 1. 1.	4						
		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.								

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
4	Explain process	Bio-renewable feed stocks can	Remember	CO 4	CLO 12	AEE551.12
	of thermo	be used as a solid fuel, or				
	chemical	converted into liquid or gaseous				
	conversion?	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.				
5	C		D	00.4	CLO 14	
5	Summarize the	Pyrolysis is a process of	Remember	CO 4	CLO 14	AEE551.14
	difference	subjecting a biomass feedstock				
	between	to high temperatures (greater				
	pyrolysis and	than 430 °C) under pressurized				
	gasification?	environments and at low				
		oxygen levels. In the process,	Second Second			
		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				
6	D'	biomass into a gas.	D	00.4	CL 0 14	AFF551 14
6	Discuss different	Main classification of gasifiers:	Remember	CO 4	CLO 14	AEE551.14
	types of gasifiers	Basically there are two types of				
	used in	gasifiers: fixed bed and				
	gasification.	fluidized bed and further in				
	-	fixed bed there are three types:				
	0	up draft gasifiers, down draft			- C	2
	1	gasifiers and cross draft				
	C.4	gasifiers.				
7	Define biomass	Biomass briquettes are a biofuel	Remember	CO 4	CLO 13	AEE551.13
	briquettes and	substitute to coal and charcoal.	1		a	
	why do we use	Biomass briquettes are made			100	
	them?	from agricultural and forestry				
		waste. The low density				
		biomass(agricultural and		1		
		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.				
8	Discuss the	The major raw material for	Remember	CO 4	CLO 13	AEE551.13
	major raw	biomass briquette are, Mustard				
	materials used in	Stalks, Sawdust, Rice Husk,				
	biomass	Coffee Husk, Coir Pitch, Jute				
	briquettes	Sticks, Sugarcane Baggasse,				
1	-	Groundnut Shell, Cotton Stalks,				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
	-	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				
9	What are the	etc. Mainly two techniques are	Remember	CO 4	CLO 13	AEE551.13
7	techniques used	available for making briquetted	Kemember	CO 4	CLO 15	ALLJJ1.15
	to make biomass	fuel from agro wastes.				
	briquettes.	1. Pyrolysed briquetted		-		
		fuel:				
		2. Direct compaction	Second Contraction	-		
10	List out the	briquetted fuel: Biomass briquetting machines:	Remember	CO 4	CLO 13	AEE551.13
10	biomass	1. Jumbo 90 briquetting	Kemeniber	004		ABE331.13
	briquetting	machine.				
	machines	2. Super 70 briquetting				
	available?	machine.				
		3. Supreme 70				
		briquetting machine. 4. Briquetting crusher		_		
		machine.		_		
11	What are the	Advantages:	Remember	CO 4	CLO 13	AEE551.13
	advantages of	1. Biomass briquette				
	biomass	plant is made from				
	briquetting?	green waste and				
		industrial waste. So, it is the clean				
		and renewable.				100
		2. When the process of	-	- 7		
	0	making briquette is		-7	- C	2
	-	going on, it does not			-	
	6	emit any harmful gases.			4	
	0	3. Easy availability of				
	100	biomass and other raw			100	
	Y	material.		Q	h	
		4. From this plant,		43		
		biomass is converted into useful biomass		~		
		briquettes. It is also		e		
		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.				
12	List out the	Biomass Briquette are widely	Remember	CO 4	CLO 13	AEE551.13
	applications of	used for any type of thermal				
	biomass	application like steam				
	briquettes?	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				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		(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	Thermochemical conversion	Remember	CO 4	CLO 12	AEE551.12
	environmental	processes such as gasification,				
	benefits of	pyrolysis and incineration can				
	thermo chemical	remove materials from the solid				
	conversion.	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		-		
14	Differentiate	Producer gas is generated in the	Remember	CO 4	CLO 14	AEE551.14
17		low temperature gasification	Remember	0.04	CLO 14	7111551.14
	netween					
	between					-
	producer gas and	process (< 1000°C) and				2
		process (< 1000°C) and contains CO, H2, CH4, CxHy,		3/	1	10
	producer gas and	process (< 1000°C) and contains CO, H2, CH4, CxHy, aliphatic hydrocarbons,	2	37	d	No
	producer gas and	process (< 1000°C) and contains CO, H2, CH4, CxHy, aliphatic hydrocarbons, benzene, toluene, and tars	31	3	5	No
	producer gas and	process (< 1000°C) and contains CO, H2, CH4, CxHy, aliphatic hydrocarbons, benzene, toluene, and tars (besides CO2, H2O, and N2 in	36	7	10.1	No
	producer gas and	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).	36	7	710.	No
	producer gas and	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	36		1101	No
	producer gas and	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	36		4710 L	No
	producer gas and	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	31		A710.	No
	producer gas and	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)	31		101/ b.	No
	producer gas and	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	31		1011 k	No
	producer gas and	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.	36		1011 k	
	producer gas and	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		No. Con	1011 V V	
	producer gas and	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			ULL K	
	producer gas and	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.	31		ULL B	
	producer gas and	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	3		ULL B.	
	producer gas and	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	3	No. Con	L'AL	
	producer gas and	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	3	No. Con	L'AL	
	producer gas and	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	3		VIL BY	
	producer gas and	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).			- Ulder	
	producer gas and	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			VIL B	
	producer gas and	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.			VII V	
	producer gas and	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			VIL K	
	producer gas and	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			VIL K	
	producer gas and	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			L'VL	
	producer gas and syngas?	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.			- UILE	
15	producer gas and	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	Remember	CO 4	CLO 14	AEE551.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	biomass	cleaner fuel for both thermal				
	gasification.	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	Second Contraction	-		
		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	E-waste comprises of waste	Remember	CO 5	CLO 17	AEE551.17
	in global	electronics goods which are not				
	context?	fit for their originally intended				
1	context.	fit for their originally intended				
	context.	use. Such electronics goods				
	context.	use. Such electronics goods may be television, telephones,				2
		use. Such electronics goods may be television, telephones, radios, computers, printers, fax				10
2	ED	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc	Pamamher	0.5	CL 0 17	AFE551 17
2	Discuss different	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 1. Solder in printed	Remember	CO 5	CLO 17	AEE551.17
2	Discuss different sources of E-	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 1. Solder in printed circuit boards, glass	Remember	CO 5	CLO 17	AEE551.17
2	Discuss different	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 1. Solder in printed circuit boards, glass panels, and gaskets in	Remember	CO 5	CLO 17	AEE551.17
2	Discuss different sources of E-	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 1. Solder in printed circuit boards, glass	Remember	CO 5	CLO 17	AEE551.17
2	Discuss different sources of E-	use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 1. Solder in printed circuit boards, glass panels, and gaskets in computer monitors. 2. Chip resistors and semi-conductors	Remember	CO 5	CLO 17	AEE551.17
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2	Discuss different sources of E-	 use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 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. 	Remember	CO 5	CLO 17	AEE551.17
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2	Discuss different sources of E-	 use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 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 	Remember	CO 5	CLO 17	AEE551.17
	Discuss different sources of E- waste.	 use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 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. 	LIP	E.C.	4 6	
2	Discuss different sources of E-	 use. Such electronics goods may be television, telephones, radios, computers, printers, fax machines, DVDs and CDs etc 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 	Remember	CO 5	CLO 17 CLO 17	AEE551.17 AEE551.17

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
	waste.	2. Health and				
		environmental issue. 3. Illegal dumping.				
		4. Imports from Europe				
		and America.				
4	What are the	1. Pollution of ground	Remember	CO 5	CLO 18	AEE551.18
	environmental concerns of E-	water 2. Acidification of soil				
	waste?	3. Air pollution				
		4. E-Waste accounts for				
		40% of lead and 75%				
		of heavy metals in landfills.				
5	What are the	1. DNA damage	Remember	CO 5	CLO 18	AEE551.18
5	health hazards of	2. Lung cancer.	Remember	005	CLO IO	11111551110
	E-waste?	3. Damage to heart, liver	<u> </u>			
	_	and spleen.				
		4. Chronic damage to the brain.				
		5. Asthmatic bronchitis.				
6	Discuss the	For the recycling of e-waste,	Remember	CO 5	CLO 18	AEE551.18
	current status of	India heavily depends on the				
	E-waste	unorganized sector as only a handful of organized e-waste	1 A A			
	management.	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				
	1	protective equipment, which are			· .	
	50	detrimental not only to their health but also to the				
	0	environment.			1	
7	List out the	Plastic, metal, glass, mercury,	Remember	CO 5	CLO 17	AEE551.17
	reusable	printed circuit board, hard			-	
	components in e-	drives, ink and toner cartridges,				
	waste.	batteries are the reusable products from E-Waste.			100	
8	Discuss current	E waste recycling industries	Remember	CO 5	CLO 17	AEE551.17
	challenges in	face certain challenges like:				
	electronic	1. Exports to developing		~		
	recycling industries.	nations 2. Less valuable materials				
		 Eless valuable materials Electronics are not 	-			
		designed for recycling				
		and reuse.				
		 Most E-waste still goes to landfills. 				
9	Discuss the	Collection and transportation	Remember	CO 5	CLO 16	AEE551.16
	process for	are two of the initial stages of				
	recycling	the recycling process, including				
	electronic waste	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				
1		make new products. After the				

10 Discuss about F. 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 convortement of non-toxic content. The convortement of non-toxic content. The convortement of measures (M &H) rules 2001.etc. CO 5 CLO 15 AEE551.15 11 List out the Few gistration of producers, collection agencies and the recyclers. Reduction of recyclers. Reduction of magencers and authorization of producers, dismantlers, collection agencies and recyclers. Reduction of magencers, collection agencies and recyclers. Reduction of magencies and recyclers. Recent countries for the Global South. Therefore, the burden of the toxicity of wastes from Wester countries in Africa, Asia, and Latin America. Remember CO 5 CLO 15 AEE551.15 13 List out any five Proto	S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
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10 Discuss about E- Waste materials are prepared for sale as usable raw multicitals for the production of new electronics or other products. Remember CO 5 CLO 15 AEE551.15 10 Discuss about E- Waste Ites acid convention for regulating trans- boundary movement. Remember CO 5 CLO 15 AEE551.15 11 List out the F- Waste Procedure and handling rules for non- toxic content. Remember CO 5 CLO 15 AEE551.15 11 List out the F- Procedure and authorization of recyclers. Remember CO 5 CLO 15 AEE551.15 11 List out the F- Procedure and authorization of recyclers. Remember CO 5 CLO 15 AEE551.15 12 What is global trade in hazardous wastc? The global waste trade is the international trade of waste between countries of the lobal south. Remember CO 5 CLO 17 AEE551.17 13 List out any five criviormmental protection laws. The global waste trade is the international trade of waste between countries of the lobal South. Remember CO 5 CLO 15 AEE551.17 13 List out any five criviormental protection laws. Protection of animals and plants Planning for the use and development of the watends, rivers and oceans) Conservation of natural and cutaret in minus, explora							
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S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	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

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