UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2018

Course: Fundamentals of Bio Energy (ETEG 315)　　　**Semester: V**
Program: Int. B. Tech. – ET+IPR
Time: 03 hrs.　　　　　　　　　　　　　　　　　　**Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Discuss different biomass energy resources and what is the energy yield from each of them?	4	CO1
Q 2	Explain the process of commercial production of ethanol from biomass.	4	CO2
Q 3	Briefly discuss types of Pilot scale pyrolysis reactors.	4	CO3
Q 4	Briefly discuss the term "Briquetting".	4	CO5
Q 5	Write short note on "Utilization of biogas in IC Engine".	4	CO4

SECTION B

Q 6	With the help of a block diagram, explain the working of an MSW incineration plant. What is the general approximate composition of MSW and what is its heating value? What are the problems in its development?	10	CO2
Q 7	Explain different types of bio-fuels.	10	CO1, CO5
Q 8	With the help of a neat diagram, explain the working of a gasifier using wood-chip biomass.	10	CO3
Q 9	Draw and explain process flow chart of biodiesel production from Jatropha curcas seeds.	10	CO1, CO4

SECTION-C

Q 10	An engine-generator system running on biogas is installed to produce 2 kW of electric power. Estimate the volume of the digester of the biogas plant required, if cow dung is used as the feed material. Given: Calorific value of biogas　　　　:20 000 kJ/m^3 Efficiency of generator　　　　: 90.1 percent		

	Engine efficiency: 30 per cent The following are some approximate rules used for sizing biogas plants or for estimating their performance: 1. 1 kg of dry cattle dung produces approximately 1 m^3 of biogas. 2. 1 kg of fresh cattle dung contains 8 per cent dry biodegradable mass. 3. 1 kg of fresh cattle dung has a volume of about 0.9 litres. 4. 1 kg of fresh cattle dung requires an equal volume of water for preparing slurry. 5. Typical retention time of slurry in a biogas plant is 40 days. **OR** Discuss general maintenance problems of biogas plants and their remedies.	**20**	**CO4** **CO5**
Q 11	A biomass gasifier is used to run a compression-ignition engine. The engine operates in the dual-fuel mode with 80% diesel replacement. The gasifier-engine system produces 350 kW of power. Calculate the biomass feeding rate to the gasifier if the efficiency of the engine is 35 percent and the calorific value of biomass is 16,800 kJ/kg. Given that the efficiency of the gasifier is 0.75.	**20**	**CO3**

Name of Examination (Please tick, symbol is given)	:	MID		END	⊔	SUPPLE	
Name of the College (Please tick, symbol is given)	:	COES	⊔	CMES		COLS	
Program/Course	:	Int. B.Tech. – ET + IPR					
Semester	:	V					
Name of the Subject	:	Fundamentals of Bio Energy					
Subject Code	:	ETEG 315					
Name of Question Paper Setter	:	Dr. Madhu Sharma					
Employee Code	:	40000357					
Mobile & Extension	:	9410133924 / 1427					

Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE":

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Name:	
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SECTION A

S. No.		Marks	CO
Q 1	Explain the desirable features of bio-ethanol that makes it suitable as automobile fuel. What grade of bio-ethanol is required for blending with petrol and why?	4	CO2
Q 2	Briefly discuss "Energy Farming".	4	CO5
Q 3	Briefly discuss types of Small-scale pyrolysis devices for fundamental research.	4	CO3
Q 4	Write short note on "Pelletization".	4	CO5
Q 5	Sugarcane is a major raw material source for bio-ethanol. Draw a process flow diagram of sugarcane industry products.	4	CO1

SECTION B

Q 6	Explain the details of a landfill reactor. What is the optimal moisture content in the MSW and what is the percentage (dry basis) of biodegradable part in the MSW? What is the gas-production rate in a landfill?	10	CO1, CO5
Q 7	The dung of 10 Cows is fed in the biogas digester and a Cow consumes 2 kg of dry mass per day. Determine the (a) volume of biogas digester (b) the power available from the digester, if the burner efficiency is 0.7 and retention time is 25 days. Density of dry mass in fluid = 50 kg/m^3.	10	CO2, CO4
Q 8	With help of diagram, explain the working of Cross draft type gasifier.	10	CO3
Q 9	Draw and explain Bio-ethanol production flowchart.	10	CO4

SECTION-C

Q 10	Discuss in details operational parameters affecting the performance of a biogas digester. **OR** Discuss in detail step-by-step process of transesterification.	20	CO4
Q 11	A biomass gasifier is used to run a compression-ignition engine. The engine operates in the dual-fuel mode with 85% diesel replacement. The biomass feed rate for the gasifier is 250 kg/h. Calculate the power produced by the engine. Assume Engine efficiency = 35 %, Gasifier efficiency = 75 %	20	CO3