Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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II SEMESTER M.TECH OPEN ELECTIVE

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: BIOFUELS ENGINEERING [BIO5261]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Define and explain Biorefinery with suitable example	**2**
1B.	Explain the suitability of the following feedstocks for biofuel - Domestic wastewater (biogas), cell debris from deoiled microalgae (ethanol), Raagi.	**3**
1C.	Define Life Cycle Analysis (LCA). Schematically explain procedure for obtaining Life Cycle Analysis of biodiesel form microalgae using raceway pond.	**3**
1D.	What are the desired characteristics of feedstock for biodiesel?	**2**
2A.	What are the disadvantages of ethanol as biofuel?	**2**
2B.	Calculate the theoretical ethanol yield (L) from 10kg mash containing 75% moisture and 15% starch on wet basis. Density of ethanol = 0.79 kg/L	**2**
2C.	Explain wet milling process for ethanol from corn. Use schematic diagram.	**3**
2D.	What are the process parameters, advantages, disadvantages of AFEX process biomass pretreatment? Explain	**3**
3A.	Define and explain Cetane number	**2**
3B.	What are the disadvantages of biodiesel in comparison with petroleum diesel?	**2**
3C.	Write the features of homogenous acid catalysis and heterogeneous base catalysis for biodiesel production from the perspectives of cost, recyclability, FFA, reaction conditions, purification of products and product yield?	**3**
3D.	What are the advantages and challenges for biodiesel from microalgae?	**3**
4A.	The formula of a sludge as feed to biogas plant is $C_{18}H_{30}O_2NS$. 100 kg of this feed was subjected to anaerobic degradation. Efficiency of degradation was 75%. Compute a) Gas composition b) Nm^3 of gas obtained c) Selling price of the gas obtained International Gas Price =\$3.5 per MM Btu; C.V of CH_4 = 55.7 KJ/g; 1 Btu =1055 J, 1\$=Rs 65, Coefficients of CO_2 is 1/8(4c-h+2o+3n+2s).	**4**
4B.	A Biogas plant using organic sludge was under normal operating conditions. There was a reported drop in biogas yield. Describe the parameters the engineer has to examine to diagnose the reasons for malfunctioning.	**3**

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4C.	Schematically draw and explain anaerobic degradation of Amino acid and Fatty acid from biodiesel plant. Draw the combined flow chart.	**3**
5A.	Define $\bar{M}_n$ (number average mol. wt) $\bar{M}_w$ (Weight average mol. wt), polydispersity	**2**
5B.	In few lines write a brief note on the following- PHB, Polylactic acid, lignin , Tannin	**2**
5C.	Explain the following with suitable examples –Foaming agents and Fillers	**2**
5D.	Illustrate the various technologies, their advantages and disadvantages, for extraction of lipids from microalgae?	**4**