Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

V SEMESTER B.TECH BIOTECHNOLOGY

END SEMESTER EXAMINATIONS, NOVEMBER/DECEMBER 2018

26th November 2018, 2-5 PM

SUBJECT: BIOFUELS ENGINEERING (BIO4014)

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A	A farmer decides to grow Jatropha for biodiesel in an area where paddy was previously grown. Make a complete Life Cycle Analysis from the perspective of biodiesel. Provide sketches and explanations for all the inputs and outputs.	**4**
1B	Define and list out the differences between First, Second and Third generation biofuels with examples	**3**
1C	How do contents of Carbohydrates, Fibre, Oil, Proteins, Minerals and Hardness of shell of a seed affect the yield and productivity of ethanol? Discuss	**3**
2A	Calculate the ethanol yield (liters) from 5 kg of feedstock which has 10% moisture and contains xylose based hemicellulose (35% on dry basis) and cellulose (40% on dry basis). Density of ethanol=0.8g/cc. Endo 1,4-β Xylanase and Cellobiohydrolase efficiencies are 85% for both and overall fermentation efficiency is 90%. Conversion factor for hydrolysis of cellulose and hemicellulose to monomers is 1.1.	**4**
2B	A microorganism needs to be selected for fermentation of feed to ethanol. What are the desired characteristics of the microorganism?	**3**
2C	It was decided to go for cob of corn for bioethanol production. Compare and contrast Steam explosion pretreatment with Ammonia treatment for the same.	**3**
3A	Define Cetane number and explain the factor affecting the same.	**2**

3B	Explain the steps involved in purification of biodiesel and glycerol phases after transesterification	**2**
3C	From the perspectives of cost, recyclability, reaction conditions, FFA and its effect, purification of product and product yield how does heterogeneous acidic transesterification catalyst perform?	**2**
3D	Explain i. Light saturation and photoinhibition of microalgae ii. Photobioreactors for microalgal biodiesel- salient features	**2** **2**
4A	A waste water contains dissolved organic matter with a gross formula – $C_{10}H_{22}O_3N$. Dissolved organic matter is 50% of the total weight and taking the basis as 1000 kg of waste water, compute, i. Yield of biogas (Nm^3) assuming 80% degradation ii. Total energy obtained from the gas, kJ **Data:** Coefficients of CO_2 is 1/8(4c-h+2o+3n+2s), calorific value of methane is 55kJ/g.	**3**
4B	With the help of schematic flow diagram, explain the four different steps involved in anaerobic degradation of lipids to biogas. Include the effect of partial pressure of Hydrogen gas and products of hydrolysis from different types of lipids in the flow diagram.	**3**
4C	Explain the following method for Biohydrogen production i. Sequential Dark and Photofermentation ii. Heat treatment method	**3** **1**
5A	Compare advantages and disadvantages of Biophotolysis, Dark fermentation and Light fermentation methods for biological hydrogen production.	**3**
5B	Compute the COD (g-COD/g-stearic acid) of stearic acid($C_{17}H_{35}COOH$) and write down the half-cell reactions.	**2**
5C	How does the voltage output from a typical Microbial Fuel Cell (MFC) vary with current density? Provide reasons for the observed three different stages.	**2**
5D	Explain the DET (Direct) and MET (Mediated) electron transfer mechanisms in MFC. What are the controlling factors in these four subcases?	**3**