MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

VII SEMESTER B.TECH. (BIOTECHNOLOGY) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: BIOFUELS ENGINEERING [BIO443]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

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

1 A .	Define the concept of Cradle to Grave analysis. How does the land use change (LUC) affect the Cradle to Grave analysis of biodiesel from Microalgae obtained? Provide the complete analysis.	3
1B.	Discuss the suitability of cassava, broken rice for bioethanol as feed	2
1C.	Define and explain the concept of bio-refinery with an example	2
1D.	With the help of two half reactions, compute the COD of $C_{18}H_{20}O_{10}$	3
2A.	 A lignocellulosic material is taken up as the feed for a new ethanol production plant. The following pretreatments are being considered (i) Concentrated Sulfuric acid (ii) Ammonia treatment Describing the process details, highlight the merits and demerits of each of the process for the given feed. 	2+2
2B.	With the help of schematic diagram, explain the Pressure Swing Adsorption for ethanol production.	2
2C.	How does the composition of internal components of a corn seed (endosperm, pericarp, tip cap and embryo) affect the various byproducts of the process?	2
2D.	Calculate the theoretical ethanol yield (mL) from 50 kg of corn which has 20% moisture and contains 70% of starch on dry basis. Write down the relevant equations of starch hydrolysis and glucose fermentation. Density of ethanol=0.8g/mL.	2
3A.	For biodiesel production, (i) Describe the various features of enzyme (immobilized and suspended) based trans-esterification (ii) In the post treatment to purify crude biodiesel, compare the warm water wash vs. membrane extraction	3+1
3B.	Compare the various microalgal disruption techniques as cited below-Osmotic shock, ultrasonication, bead mill and supercritical fluid extraction	3
3C.	Using Schematic representation of electron transfer mechanism from the microbial metabolism to the anode, explain Direct electron transfer (DET) and Mediated electron transfer (MET)	3
4 A .	Compare sequential dark-photo fermentation vs combined dark-photo fermentation	3

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	for Hydrogen manufacture	
4B.	Write briefly about three different strategies for enhancing hydrogen production	2
4C.	Calculate the Coulombic efficiency of a MFC with the following conditions Resistance = 900Ω COD = 1.1 g/L Anode chamber volume = 0.09L Steady voltage = 0.92V (for 80h)	3
4D.	Compare and contrast 1-chamber and 2-chamber MFC	2
5A.	A feed for biogas was found to contain equal quantities of Starch and Proteins. Draw the <u>combined</u> schematic diagram for the various biochemical steps involved in the production of biogas.	3
5B.	Estimate theoretically the composition of biogas formed and Nm ³ of the biogas from wastewater sludge whose elemental composition (weight fraction) as 0.5 (C) 0.08(H), 0.35(O), 0.06(N) and 0.01(S). Coefficient of CO ₂ is $1/8(4c-h+2o+3n+2s)$. Take basis as 100 kg sludge.	3
5C.	Compare and contrast Jatropha based biodiesel vs. Microalgal based biodiesel	2+2
6.	 Write short notes on 1. Pretreatment of biodiesel feedstock 2. Voltage curve of polarization vs current density in MFC 3. Enzyme detoxification for lignocellulosics 4. Barley as biofuel feedstock 5. Hydrogenase enzyme 	2 3 2 1 2