M.TECH/REEN/2ND SEM/REEN 5243/2017

BIO ENERGY

(REEN 5243)

Time Allotted: 3 hrs **Full Marks: 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>Any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 x 1=10**

(i) When a bioprocess takes place
(a) the product becomes non biodegradable
(b) high pressure is required
(c) high temperature is required
(d) both (b) & (C) are not true.

(ii) The term Gasification is related to:
(a) oxidation (b) reduction
(c) pyrolysis (d) combination of a-c .

(iii) *Shewanella putrefaciens* is considered as standard bacteria for
(a) 0RBRC reactor (b) microbial fuel cell
(c) producing antibiotics (d) ultra filtration module.

(iv) Grey Water is also termed as:
(a) sewage (b) river water
(c) sullage (d) spring water.

(v) The producer gas from bio mass gasification is a combination of
(a) CO, H_2 , CO_2 (b) CO_2, H_2O, NO
(c) CO, H_2 , CH_4 (d) none of the above .

(vi) Typical Concentration of the parameter MLSS Activated sludge Process is
(a) 0 (b) Infinity
(c) less than 1000 (d) between 2000-4000.

(vii) Bio-methenation is carried by
(a) bacteria
(b) chemical reactions of Bio-Masses
(c) physical reactions of Bio-Masses
(d) fermentation.

(viii) The typical reactions for production of Bio Diesel involve
(a) aldol Condensation (b) transesterification
(c) pyrolysis (d) polymerization.

(ix) Root Zone treatment is a low cost treatment using
(a) Extended Aeration System (b) Trickling Filter
(c) Canna Species (d) Earthworm.

(x) The system of operation of Facultative pond is
(a) purely aerobic
(b) purely anaerobic
(c) aerobic in day & anaerobic in night time
(d) none of the above.

Group - B

2.(a) Delineate the basics of Photo-synthesis process with reactions, brief reaction mechanism and plausible explanations wherever necessary.

(b) What do you mean by Biomass Energy potential? Sketch the standard Biomass Energy Paths.

6 + 6 = 12

3. Present a case study involving the process of utilization of Canteen Food Waste in a medium sized industry serving 2000 persons per day.

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Group – C

4.(a) Discuss the different zones in a Gasifier generating Producer gas with a neat sketch.

(b) Discuss the principles & operation of a composting plant

5 + 7 = 12

5. Discuss the construction and operation of a Rotating Biological Disk Contactor required to be set up for a medium sized Renewable Energy Industry with a workman force of 1000 per day with a neat sketch.

8 + 4 = 12

Group – D

6.(a) A mixture of water and ethyl alcohol containing 0.16 mol fraction alcohol is continuously distilled in a plate fractionating column to give a product containing 0.77 mol fraction alcohol and a waste of 0.02 mol fraction alcohol. It is proposed to withdraw 25% of the alcohol in the entering stream as a side stream with a mol fraction of 0.50 alcohol.

(b) Determine the number of theoretical plates required and the plate from which the side stream should be withdrawn if the feed is liquor at the boiling point and a reflux ratio of 2 is used.

6 + 6= 12

7. (a) Discuss the process of Bio-diesel production by highlighting the following: Raw Material.

(b) Reaction Pathways.

(c) Fuel Characteristics .

4 + 4 + 4 = 12

Group - E

8. The bioconversion of sucrose by the enzyme sucrase at room temperature resulted in the batch reaction data given in the table below:

C	m moles / l	1.0	0.84	0.68	0.53	0.38	0.27	0.16	0.09	0.04	0.018	0.006	0.0025
t	hr	0	1	2	3	4	5	6	7	8	9	10	11

The initial concentration used was 0.01m moles / l . Determine whether these data can reasonably fit the Michaelis-Menten kinetics.

$$-r_A = \frac{k_3 C_3 C_E}{C + k_m}$$

where k_m is the Michaelis-Menten constant. If the fit is reasonable determine the constants k_3 and k_m. Use integral methods of analysis.

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9.(a) What is Photo-bioreactor?

(b) Write technical notes on :
i) Raceway pond.
ii) Moving grate Combustor.

2 + (5 × 2) = 12