Ref. No.: Ex/PG/EST/T/129A/2024

M. TECH. ENERGY SCIENCE AND TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION – 2024

Subject : BIO-ENERGY TECHNOLOGY

Time: Three hours Full Marks: 100

Use Separate Answer Scripts for Each Part

Part – I (60 Marks)

Answer **any three** questions.

1. What is the concept behind the recycling of 'active biomass' in an anaerobic digester ? Describe the working principles of 'anaerobic filter reactor' and 'anaerobic sludge blanket reactor'. 20

2. Deduce the Michaelis Menten equation for enzyme catalyzed biochemical reaction. How do you obtain the values of K_m and V_m from the Michaelis Menten Equation ? 20

3. a) What is loading of an anaerobic reactor ? Show that for a CSTR without cell recycle Mean Cell Retention Time and Hydraulic Retention Time are same. 6

   b) A primary sewage sludge containing 5% dry solids of which 60% are volatile, is produced at a rate of 100 m^3 per day and is to be digested sufficiently to destroy 50% of the volatile solids. What volume must the digester have and what will be the loading on the digester, if the temperature is maintained at 35^0C ?

   Data given:
   i) Required MCRT (mean cell retention time) for 50% destruction of volatile solids at 35^0C is 14 days.
   ii) Density of sewage sludge = 1000 kg/m^3 14

4. Discuss the functions of the different components of an Improved Biomass Stove. Describe how the thermal efficiency of a biomass stove is measured. 20

[Turn over

Ex/PG/EST/T/129A/2024

MASTEROFTECHNOLOGYIN ENERGY SCIENCE&

TECHNOLOGY EXAMINATION, 2024

(2nd Semester)

BIO - ENERGY TECHNOLOGY

Time: Three hours Full Marks: 100

Use a separate Answer- Script for each part

PART-II (40 marks)

Answer ***any two*** from the following questions

[20X2 = 40]

1. (a) What are different routes to convert biomass to usable form of energy? Discuss in details.

   (b) Discuss different biomass properties which influenced the design of a biomass gasifier.

   [10+10=20]

2. (a) What do you understand by biomass gasification? Explain its principle.

   (b) With neat sketch explain the function of downdraft gasifier.

   [10+10=20]

3. (a) Discuss gasifier based SI and CI engine characteristics on power rating and emission.

   (b) With a schematic diagram show different components of biomass gasifier based power plant.

   [10+10=20]

4. a. Discuss the advantages and disadvantages of using biodiesel as a replacement of diesel fuel.

   b. With a schematic diagram explain the techniques for transesterification of oil or fat for biodiesel production.

   [08+12=20]