Registration No. | | | | | | | | | |

M.E./M.Tech. Degree Examinations, January 2017

First Semester

BIOTECHNOLOGY

BY16101 – BIOPROCESS TECHNOLOGY

(Regulation 2016)

QP Code:669934

Time: Three hours **Maximum : 100 marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

1. Define yield coefficient and degree of reduction.
2. Discuss the principle of black box modelling.
3. Distinguish between structured and unstructured models.
4. State Luedeking - Piret Equation.
5. Give the kinetic equation relating substrate utilization and product formation.
6. Differentiate batch and fed batch cultures.
7. How is mixing time estimated in bio processing?
8. Compare oxygen uptake rate and oxygen transfer rate.
9. Explain the requirements for the production of algal biofuels?
10. Describe the advantages of green chemicals over nondegradable chemicals.

PART B - (5 X16 = 80 Marks)

11. (a) The experimental measurements for an organism have shown that cells can convert two-thirds (w/w) of the substrate carbon (alkane or glucose) to biomass. **(16)**

(i) Calculate the Stoichiometric coefficients for the following reactions:

Hexadecane: $C_{16}H_{34} + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + eCO_2$

Glucose: $C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + eCO_2$

(ii) Calculate the yield coefficients $Y_{X/S}$, $Y_{X/O2}$ for both the reactions. Comments on the differences.

(OR)

(b) Discuss the systematic analysis of black box stoichiometries. **(16)**

12. (a) Describe the unstructured models in fermentation with example. **(16)**

(OR)

(b) Explain the models for gene expression and regulation in detail. **(16)**

13. (a) Explain the kinetics of substrate utilization, biomass growth and product formation. **(16)**

(OR)

(b) Discuss the design and operation of total cell retention cultivation in detail. **(16)**

14. (a) Discuss the design and construction of Continuous Stirred Tank Reactor for the production of biomolecules. **(16)**

(OR)

(b) Discuss the physical and chemical parameters that are required to be monitored and controlled in the fermentation process which would consistently produce quality products. **(16)**

15. (a) Explain the production of recombinant insulin. **(16)**

(OR)

(b) Discuss the need and procedure followed in process optimization in a bioreactor with suitable example. **(16)**