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KIBABII UNIVERSITY
FACULTY OF SCIENCE

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

FIRST YEAR 1ST SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE RENEWABLE
ENERGY

COURSE CODE: IPT 331

COURSE TITLE: BIOPROCESS ENGINEERING

DATE: 29/9/2017

TIME: 2.00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question one (1) and any other two (2) Questions. Question one is compulsory and carries 30 marks, the other Questions carry 20 marks each.

TIME: 2 Hours

This paper consists of 2 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1

- a) Define
 - i. Bioprocess engineering (1 mark)
 - ii. Fuel alcohol (1 mark)
 - iii. Batch bioreactor (1 mark)
- b) Why are microorganisms preferred to chemical process in product manufacturing? (3 Marks)
- c) The culture medium elemental requirements for microbial cells in fermentation processes are estimated using the formula $C_4H_7O_2N$
 - i. What does this mean? (2 Marks)
 - ii. Could this formula facilitate the formulation of ideal media requirements for specific industrial microorganisms? Explain (5 Marks)
- d) What is the purpose of growing microorganisms under controlled conditions? (3 Marks)
- e) Discuss the major differences among the bioreactor types and recognize their constraints (6 Marks)
- f) State why a chemostat is difficult to operate (3 Marks)
- g) Explain why it is crucial to sterilize nutrients media in batch volumes in the bioreactor at 121°C (5 Marks)

Question 2

Draw normal growth curve showing the phases of microbial growth. Discuss this mode of growth and how it influences bioreactor design and product yield in a batch culture fermentation system (20 Marks)

Question 3

Discuss the physical factors that affect oxygen transfer in bioreactors (20 Marks)

Question 4

Discuss the challenges of modelling bioprocess (20 Marks)

Question 5

Discuss the physical design and functioning of any two bioreactors for a named target industrial product (20 Marks)