BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI – DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2011 – 2012
BIOT C337 INDUSTRIAL MICROBIOLOGY & BIOPROCESS ENGINEERING
COMPREHENSIVE EXAMINATION (CLOSED BOOK)

Duration: 3hours. **Date: 7.6.2012** **Max. Marks: 30**

Note: a) Answer all the questions b) answer to the point and c) draw suitable diagrams if required.

1. Explain with a suitable diagram for a fermenter with different components, controls and functions. Mention the applications of batch and continuous fermentations. [3.0]

2. Explain any two methods for monitoring microbial growth in culture in a bioreactor.[2.0]

3. Name four (4) fermentation products with name the substrate, enzyme and the microbes. [2.0]

4. Write the (a) pathway and (b) the microbes which carry out the biosynthesis of 2,3-Butanediol fermentation and mention its applications. [2.0]

5. How the microorganisms are categorized based on nutritional requirements? Explain with suitable examples on nitrogen sources utilized by the Fermentation industry. [2.0]

6. What are the different types of carbon sources used in fermentation media? Briefly explain on biomass yield coefficient with suitable examples. [2.0]

7. Explain the following with suitable diagrams.
   a. Control of chemical and physical conditions by agitation and different methods. [2.5]
   b. Mass transfer. [2.5]

8. Explain in detail on solid-substrate fermentations with respect to process parameters, environmental factors, and the different types of solid-substrate fermenters. [2.0]

9. What are the different methods by which the large scale cell separations are carried out and explain any two methods with suitable diagram. [2.0]

10. What are detergent enzymes and mention any two examples and the producer organism for each? [1.0]

11. What are the different methods by which the citric acid is produced? Briefly explain. [1.5]

12. What are the different fungal metabolites used in therapeutic activity? Give any four class of compound, fungal metabolite, and the producer organism for each class of compound. [2.0]

13. Why food additives are used in food industries? Give any four additive function, and examples of commercially available products and producer organism. [2.0]

14. Write a short note on different methods by which large scale microbial cells are achieved and mention applications? [1.5]

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TEST-II (OPEN BOOK)

Duration: 50 min. **Date: 26.4.2012** **Max. Marks: 20**

Note: Answer all the questions
Answer to the point

1. How the production of α-amylase from *Bacillus subtilis* is achieved and develop a method for the large scale production strategies? Justify with your chosen method for *Bacillus subtilis*. Explain in detail on the methods to be selected for gram positive and gram negative bacteria and optimization for large scale production. Provide suitable schematic diagrams. [6.0]

2. What are the different methods, regulations and control mechanisms adopted for the use of GMM? [3.0]

3. What are the different factors which affect protein isolation and purifications? Explain how efficiently protein purification can be achieved in industrial scale production. [3.0]

4. Explain downstream processing methods with suitable diagram for a 750 ml bacterial culture obtained from a pilot scale fermenter. The objective is to collect the soluble protein component which is produced for pharmaceutical applications. [4.0]

5. How industrial enzymes important and mention major classes of enzymes and its typical industria use and methods for recycling/regeneration of enzymes? Explain any one method with suitable diagram. [4.0]

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TEST-I (CLOSED BOOK)

Duration: 50 min. **Date: 11.3.2010** **Max. Marks: 20**

Note: Answer all the questions
Answer to the point

1. Define (a) specific growth rate constant (μ) and (b) yield coefficient (Y). [2.0]

2. Briefly explain in detail on critical dilution rate (D_{crit}) with a suitable diagram. [3.0]

3. How the microbial growth in culture is monitored in industrial fermentations? Explain any three methods in detail. [3.0]

4. What are the ideal features of industrial microbes and mention how important the strain improvement methods in industrial production? [1.5]

5. Briefly explain the bacterial growth curve with respect to significant implications in fermentation technology. [2.5]

6. What are secondary metabolites? Name any four (4) secondary metabolites produced by fungi and the biosynthetic pathways involved. [4.0]

7. What are the heavy molecular weight materials which act as carbon and nitrogen energy source and how these are utilized by the industrial microbes? Briefly explain with suitable examples. [4.0]

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QUIZ-II (CLOSED BOOK)

Duration: 20 min. **Date: 22.5.2012** **Max. Marks: 5**

Name:

ID No:

Note: Answer to the point

1. What are the two major substrates for industrial ethanol production? [1.0]

2. Mention any two processused in citric acid production and the microorganism used in each process. [1.0]

3. What is the basic structure of the penicillin and mention the present penicillin yield in industrial fermentations? [1.0]

4. Mention any two fungal metabolite and the producer organism for following: [1.0]

Compound	Metabolite	Producer organism
a. alkaloids:	_____	_____
b. antibiotics:	_____	_____

5. Write any four recombinant proteins produced for medical use by microbial fermentations. [1.0]

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QUIZ-I (CLOSED BOOK)

Duration: 20 min. **Date: 3.4.2012** **Max. Marks: 5**

Name:

ID No:

Note: Answer to the point

1. Briefly explain any two different mechanisms by which the agitation is carried out in a fermenter? [1.0]

2. What is Reynolds number (Re). Explain. [1.0]

3. Write a short note on any two types of solid-substrate fermenters with examples. [1.0]

4. How the transfer of nutrients and oxygen from aqueous phase into the microbial cells during fementation is achieved? Brief on factors that influence efficient transfer and the mechanism involved? [1.0]

5. What are the key factors that influence the yield during the scale-up processes? [1.0]