Department of Forest Products Technology

PUU-0.4300 NEW FIBRE MATERIALS: BIOCOMPOSITES

Examination date: Friday 11th April 2013

Total marks 35

1. Define the following terms (use a diagram if necessary):
   i. Young's modulus
   ii. Aspect ratio
   iii. Pultrusion
   iv. Twin screw extruder
   v. Bast fibre

(5 marks)

2. Answer briefly (in around a quarter of a page, using diagrams if necessary) **all** of the following:
   i. Define what is meant by a composite material
   ii. Describe what is meant by a 'crack-stopping' or 'crack-blunting' mechanism and how does it operate?
   iii. What is meant by 'fibre volume fraction'? Explain the significance of fibre volume fraction in composites technology
   iv. Briefly describe the resin transfer moulding (RTM) process
   v. Explain what is meant by the principle of 'load sharing' in fibre reinforced composites

(10 marks)

3. The 'fibre architecture' of a composite strongly influences its properties. Describe, in about 1 page, what is meant by fibre architecture and how it influences the mechanical properties of a composite (5 marks)

4. Answer **both** parts (use around half a page for the answer to each part):
   i. Briefly outline and discuss **one** advantage and **one** problem of using natural fibres as reinforcement in a polymer matrix composite
   ii. Explain how the aspect ratio of a fibre affects the efficiency of stress transfer in a composite in which the fibre is loaded parallel to its axis (you may wish to use a diagram to support your description)

(5 marks)

5. Write an essay (2-3 pages) on **one** of the following:
   i. Raw materials and processes in the manufacture of biocomposites
   ii. Biopolymers for biocomposites
   iii. Strategies for reducing the environmental impact of biocomposites

(10 marks)