Department of Forest Products Technology

PUU-0.4300 NEW FIBRE MATERIALS: BIOCOMPOSITES

Examination date: Thursday 28th May 2015

Total marks 50

1. Define the following terms (use a diagram if necessary):
   i. Hooke's law
   ii. Poisson's ratio
   iii. RTM
   iv. Matrix
   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 pultrusion process (8 marks)

3. Answer **all** parts:
   i. What is meant by the principle of 'load sharing'?
   ii. Briefly outline and discuss one advantage and one problem of using natural fibres as reinforcement in a polymer matrix composite
   iii. 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) (12 marks)

4. Answer **both** parts:
   i. Briefly explain the main energy absorbing mechanisms that contribute to a composite's overall work of fracture
   ii. Explain what is meant by the term 'fibre architecture' and briefly explain how fibre architecture affects the properties of a composite (10 marks)

5. Explain how the properties of a biocomposite material are affected by the presence of defects in natural fibres (5 marks)

6. Describe how the 'reinforcement architecture' ('fibre architecture') affects the properties of a composite. (10 marks)