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UNIVERSITY COLLEGE

UNIVERSITY COLLEGE TATI (TATIUC)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BPE 3273
COURSE	: POLYMER COMPOSITE
SEMESTER/SESSION	: 2-2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer **ALL** questions.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Composite materials are the combination of two or more materials and consist of three constituents. Discover each of the constituents. (6 marks)

b) Investigate **TWO (2)** characteristics of reinforcement that influence the properties of composites. (4 marks)

c) Glass, carbon, and aramid are the three types of common fiber for fiber reinforcement polymer (FRP) composite. Point out **TWO (2)** advantages and **ONE (1)** application for each type of fiber. (9 marks)

d) Give a brief explanation of safe fiber storage. (6 marks)

QUESTION 2

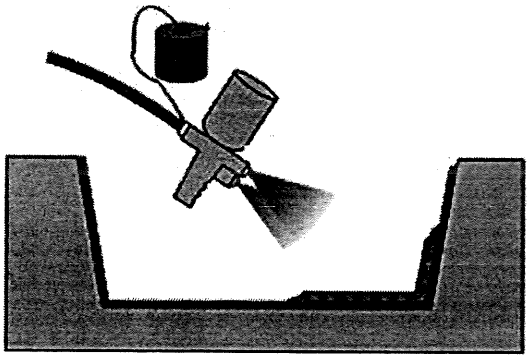

Figure 1

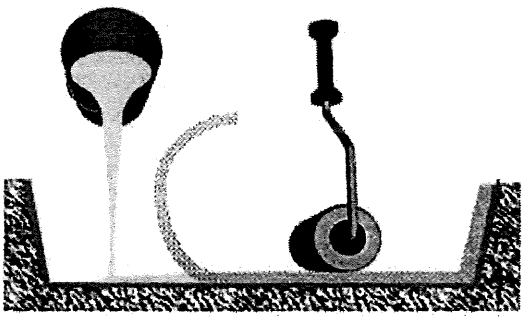

Figure 2

a) Figure 1 and Figure 2 are composite manufacturing techniques that have been widely used to produce boat hulls, storage tanks, and bathtubs.

   i. Identify the techniques and give comparisons between the two techniques. (9 marks)

   ii. Distinguish the advantages and disadvantages each of technique. (4 marks)

b) Both release agents and gelcoats are crucial components in the composite manufacturing process. Differentiate these materials based on their main function. (4 marks)

c) Explain the pultrusion process for the manufacture of fiber-reinforced plastics. List **TWO (2)** advantages of this process. (8 marks)

QUESTION 3

a) One of the theories of adhesion is chemical bonding. Explain how chemical bonding contributes to the intrinsic adhesion in composite and give an example. (3 marks)

b) Microbond test is a single fiber-matrix interfacial bond test method to determine the interfacial shear strength. Carry out the steps that involve in this method. (10 marks)

c) Relates how fiber length distribution and fiber orientation affect the properties of a composite. (4 marks)

d) A unidirectional carbon-fiber-epoxy-resin composite contains 64% by weight of carbon fiber and 36% epoxy resin. The density of the carbon fiber is 1.80 g/cm^3 and that of the epoxy resin is 1.22 g/cm^3. Calculate the fiber volume fraction. (4 marks)

e) Predict the thickness of a laminate consisting of 4 layers of 550 g/m^2 chopped strand mat if the fiber volume fraction is 0.36. Assume the density of the fiber is 1.5 g/cm^3. (4 marks)

QUESTION 4

a) Analyze the effects of voids on composite properties. (4 marks)

b) There are several test methods to identify and characterize voids in composite materials. Classify **FOUR (4)** of the test methods. (4 marks)

c) Differentiate between continuous and discontinuous fiber. (8 marks)

d) Despite having less fracture strength, discontinuous fiber has several advantages. Recognize **TWO (2)** advantages and **TWO (2)** applications of discontinuous fiber. (4 marks)

e) Predict the examples of continuous reinforcement (a) and discontinuous reinforcement (b) in Figure 3 (5 marks)

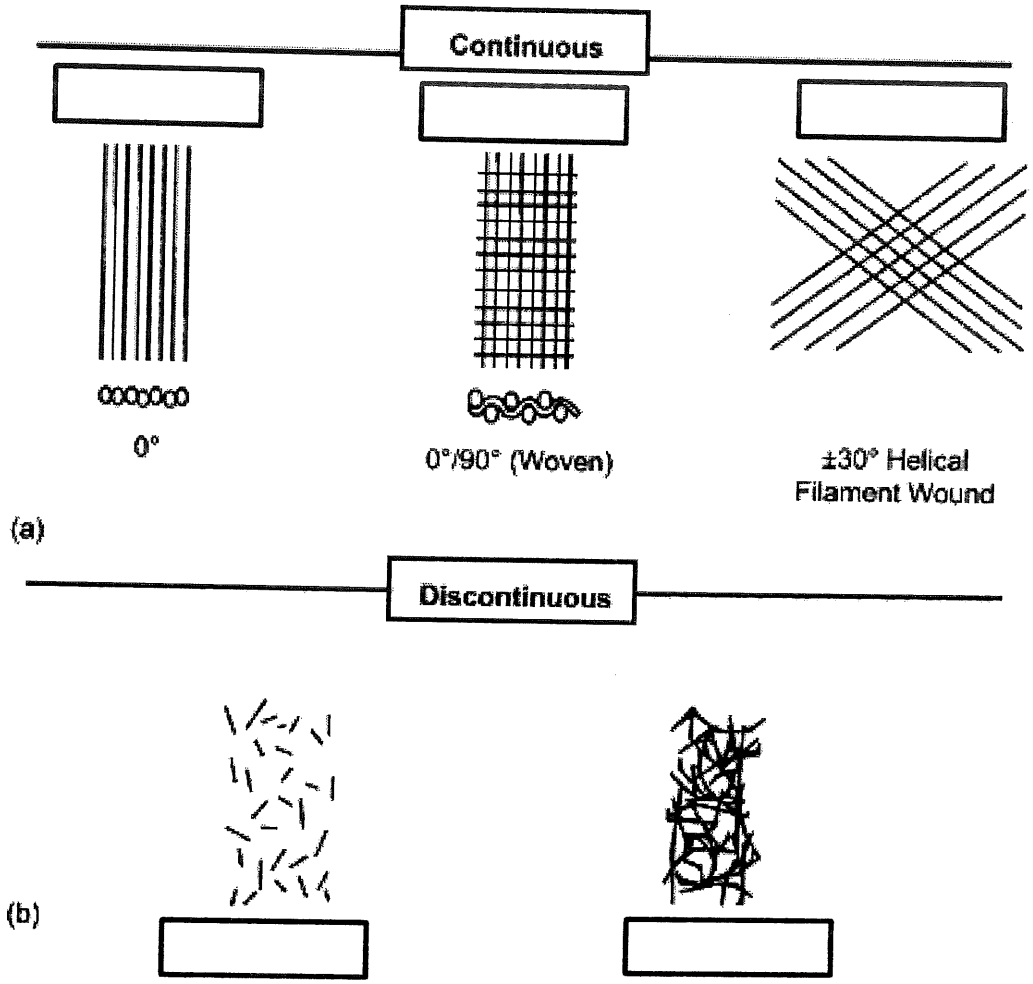

Figure 3

----------End of Questions----------