

PTL 706: Polymer Testing and Properties
Major Test, Sem. II, 2007-2008

Full Marks: 60

Time: 2 Hour

1. Polymer composite was injection molded to a dumb-bell shaped specimen 1.2 cm in width and 4.2 mm in thickness. The specimen was tested in a tensile mode on a zwick Universal Testing machine until it breaks. The cross- had separation was 6 cm and the stress-strain curve was essentially linear, up to fracture. The rupture load was 500 kg while the extensometer showed an increase of length of 0.03 cm. Calculate the Young's modulus, strain-at-break, and breaking strength of the composite.

(10)

2. A glassfibre- reinforced polycarbonate was made in the form of a rectangular beam with a length 70 cm, width 4 cm and thickness (depth) 2.8 cm. A load of 8.5 kg was applied centrally at the midspan while the beam was supported at each end. Calculate the flexural strength, the maximum deflection at the midspan and the flexural strain of the composite. The young's modulus in flexure is $9.5 \times 10^9 \text{ N/m}^2$

(10)

3. (a) Using a suitable spring-dashpot model elucidate the impact behavior of polymer.

b) Give a brief account on the properties of glass fibre filled thermo sets Highlight the impact performance.

(7+3=10)

4. a) Thermal conductivity of a plastic composites was measured using a plate-like sample 4 cm x 4 cm in the sides and 1.33 cm in thickness. The high temperature side was at 45°C while the cooler surface was at 15°C . The recorded heat flow as 48.35 W. calculate the thermal conductivity of the composites in W/m.K. The heat flow was through the thickness of the sample.

b) Define the following parameters of a dielectric material:

- (i) power factor
- (ii) dielectric constant

c) Write a brief account on the abrasion resistant applications of flooring materials.

(6+2+2+=10)

5. a) Write down a brief description on the distinguishing characteristics of environmental stress cracking of polyethylene.

b) Write a short note on Henry's law of sorption.

c) Two polymer compositions were tested for their hardness values on shore A hardness scale. While one composition showed a value of 25 the other had a value of 50. Suggest suitable application for the materials. Give your reasons.

(5+2.5+2.5=10)

6. Select suitable polymers and tests for both raw materials and the finished product. Justify your selection of tests.

- a) mixie bowl
- b) crash helmet
- c) wall covering in a corporate office
- d) food tray used in a shopping mall
- e) computer housing

(5x2=10)