UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 7 Examination in Engineering: October 2019

Module Number: ME7314 **Module Name: Polymer Engineering (TE)**

[Three Hours]

[Answer **all questions**, each question carries **12** marks]

Q1. a) Polymers can be classified into four groups based on origin of source, structure, molecular forces and mode of polymerization. Briefly explain the sub categories of each classification with suitable examples.

[4.0 Marks]

b) Briefly explain the term "Polyallomer" with examples.

[1.5 Marks]

c) Define the term "Stereo regularity" and briefly explain three categories of stereo regularity with suitable diagrams.

[2.5 Marks]

d) The plastic state of rubber transfers to elastic state by adding sulphur which is made to allow for some cross-linking or vulcanization. Briefly explain this state transformation with its chemical reactions.

[2.5 Marks]

e) In real applications, rubber cubes are sprayed with the mix of calcium carbonate and a solvent before export or shipping. Briefly explain the reason for above mentioned spraying process.

[1.5 Marks]

Q2. a) i) Define the term "Polymerization".

ii) There are four basic polymerization methods used for the production of polymers from one or more monomers. What are those four methods?

iii) Briefly explain two (02) of above mentioned polymerization methods.

[4.0 Marks]

b) Injection molding is the most widely used polymeric fabrication process. It can be used to form a wide variety of products.

i) Injection molding machine consist of two basic parts, an injection unit and a clamping unit. Identify the main components of each basic part of an injection molding machine by presenting a sketch and briefly explain the function of each component.

[4.0 Marks]

ii) What are the advantages and disadvantages of injection molding process compared with other polymer manufacturing processes?

[2.0 Marks]

iii) There are many details to pay attention in injection molding which affects the physical properties and they may even cause to the failure of the molding. Briefly explain three major problems encountered in injection molding process.

[2.0 Marks]

Q3. a) Identify the following resin identification codes.

[4.0 Marks]

b) "Though plastic is useful, its effect on environment is undesirable" Discuss on this.

[4.0 Marks]

c) Discuss on ways to prevent plastic pollution.

[4.0 Marks]

Q4. a) Briefly explain the functions of extruder machine while identifying the major components of extruder machine by using a sketch.

[4.0 Marks]

b) Write two plastic products manufactured using following each polymer processing technique.

i) Profile extrusion
ii) Compression molding
iii) Thermoforming
iv) Blow molding

[4.0 Marks]

c) Briefly explain following thermoforming processes.

i) Vacuum thermoforming
ii) Pressure thermoforming
iii) Mechanical thermoforming

[4.0 Marks]

Q5. "Injection molding is the most popular process for manufacturing thermoplastic products. From its birth in the late 1800s to the present time, the injection-molding industry has grown at a fast and steady rate. It has evolved from producing combs and buttons to molding products for varied industries, including automotive, medical, aerospace, consumer, toys, plumbing, packaging, and construction."

a) Identify two features and explain with suitable sketches how the part of an initial 3D model showing in Figure Q5 to be redesigned so that it can be produced using injection molding with reference to the various defects possible. If require you may attach the Figure Q5 to your answer sheet and refer it suitably.

[4.0 Marks]

b) List and describe four (4) main parameters that control and have the greatest effect on the overall quality and cost of the finished molded part or product.

[4.0 Marks]

c) Gates can be categorized mainly as manual trimming gates and automatic trimming gates. Name and sketch two (2) gate types for each trimming gate above and briefly explain the deciding factors of each gate type.

[4.0 Marks]

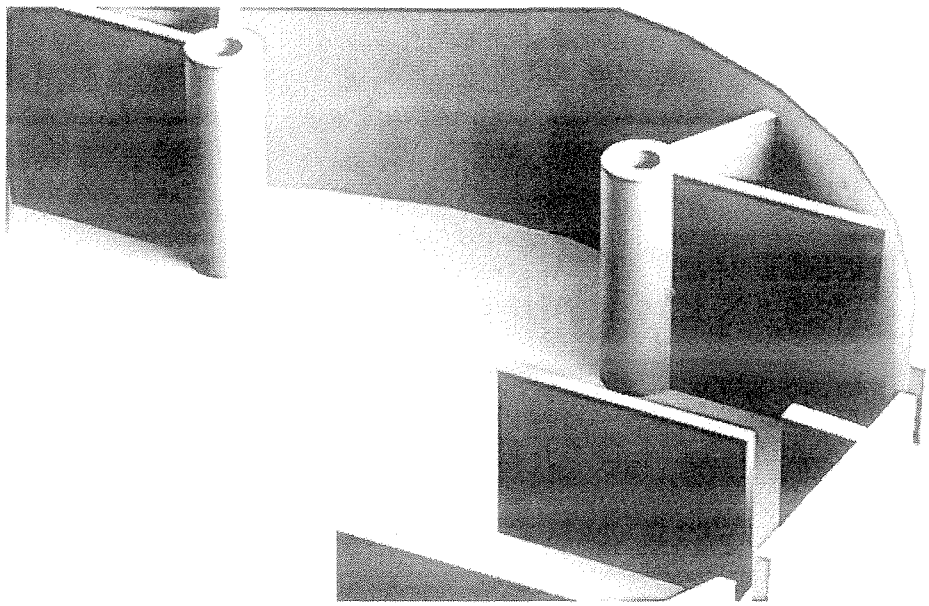

Figure Q5