RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A./M.Sc. THIRD SEMESTER EXAMINATION, DECEMBER 2024

SECOND YEAR [BATCH 2023-25]

Date : 05/12/2024 **APPLIED CHEMISTRY**

Time : 11.00 am – 1.00 pm **Paper : CC 13 [Polymer Science & Technology III]** Full Marks : 50

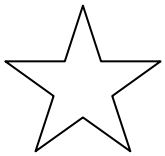
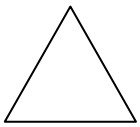
Group :A

Answer **any four** questions: [4×10]

1. Match the column A with B with proper reason: [2×5]

Column A	**Column B**
i) Blow molding	a) twin screw
ii) Rotational molding	b) use of a gas
iii) Reaction injection molding	c) Polyurathane
iv) extrusion	d) Conveyer Belt
v) Calendaring	e) centrifugal force

2. Justify the following statements with examples wherever suitable [2×5]
   a) Multilayer packaging films are difficult to recycle than single layer films.
   b) Productivity of injection molding process is higher than the compression molding process
   c) Higher screw depth favours higher extrusion rates in an extruder during polymer processing
   d) Slower strain rate can lead to higher elongation than higher strain rate during static tensile testing of a rubber sample
   e) Roto molded parts have higher longevity than the blow molded parts.

3.  

   (i) (ii)

   Consider the above two products. Both have equal thicknesses. Logically explain which molding technique among compression and/or injection (one technique for one product only) would be appropriate for them to mold keeping in mind the productivity issue. In case you select injection molding for a product, must also explain where the gate should be framed? [5+5]

4. Write short notes on the following: [2×5]
   a) Rubber extruder vs plastic extruder
   b) Role of MFI of the thermoplastics during blow molding process
   c) Torsion test of rubber compound
   d) Primary recycling vs tertiary recycling
   e) Linear economic model vs circular economic model

5. Match the column A with B with explanation: [2×5]

Column A	**Column B**
i) Reclamation	a) Laboratory management
ii) Devulcanisation	b) Testing
iii) Characterisation	c) Degradation
iv) Calibration	d) Selective devulcanisation
v) ISO	e) Towards precision

6. a) What are the major impacts of polymer waste on environment?
   b) How lower carbon footprint can reduce GHG emissions? Mention some methods.
   c) Mention some advantages in recycling of polymers.
   d) Write short notes on -
      i) Mechanical recycling
      ii) Thermal recycling
      iii) Chemical recycling. [3+2+2+3]

Group :B

Answer **any two** questions: [2×5]

7. a) Draw and describe the injection molding cycle.
   b) Why the gate of an injection mold has the lowest dimension?
   c) Explain whether a polymer compound should have a high Cp or a low Cp value to be appropriate for injection molding? [2+2+1]

8. Discuss the following:
   i) Die swell vs viscoelastic effect
   ii) Roles of screw speed, die temperature and die length in controlling the extrudate swell [2+3]

9. a) How does the molding pressure and temperature affect the quality of the final product in compression molding?
   b) What industries commonly use compression molding and for what types of product? [3+2]

10. a) How do you test the durability of polymers under uv exposure?
    b) In which methods you will analyze polymer crystallinity? Justify your answer. [2.5+2.5]

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