Solution Set

Plastic Processing and Conversion Technologies

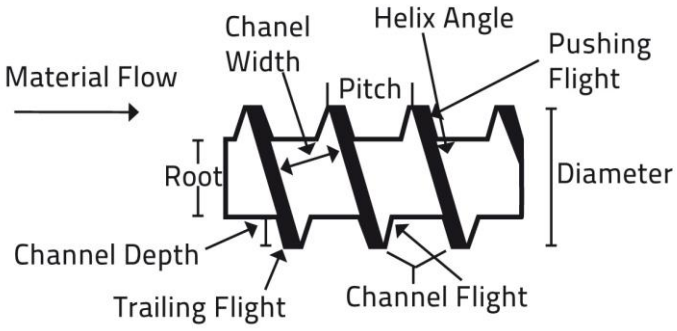
1 A. Hint Words – MFI, HDT, VICAT, DSC, viz [**2Marks]** Explaining MFI with diagram significance [**3Marks**]

B. Hint Words – For giving proper sequence [**3 Marks**]

Symbol	Acronym	Full name and uses
1	PET	Polyethylene terephthalate - Fizzy drink bottles and frozen ready meal packages.
2	HDPE	High-density polyethylene - Milk and washing-up liquid bottles
3	PVC	Polyvinyl chloride - Food trays, cling film, bottles for squash, mineral water and shampoo.
4	LDPE	Low density polyethylene - Carrier bags and bin liners.
5	PP	Polypropylene - Margarine tubs, microwave-able meal trays.
6	PS	Polystyrene - Yoghurt pots, foam meat or fish trays, hamburger boxes and egg cartons, vending cups, plastic cutlery, protective packaging for electronic goods and toys.
7	Other	Any other plastics that do not fall into any of the above categories. For example melamine, often used in plastic plates and cups.

Reason for each code is its ability to be recycled number of times [**2Marks**]

C. Hint: Proper explanation of the sections fetch [**5 Marks**]

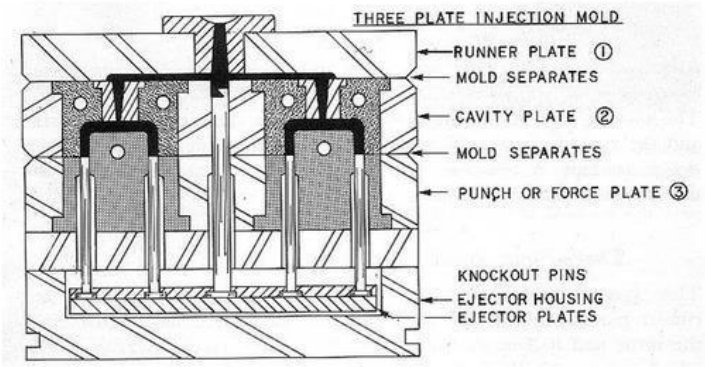


D. Hint Words: During the process of heating, some solid gets melted and if quench cooled, instead of crystallizing, gets converted to amorphous solid form appearing as that of glass. This glass formation is seen because of the dynamic arrest of molecules forming a disordered state at Tg [**3 Marks]** logical reasoning in relation with plastic processing [**2 Marks**]

2 A. Hint words: Categorizing dies based on the type of product, openings, location, stationary/rotating viz. [**5 Marks**] and explaining factors considered like L/D, Compression ratio, Type of screw (inter-meshing/non-intermeshing) [**5 Marks**]

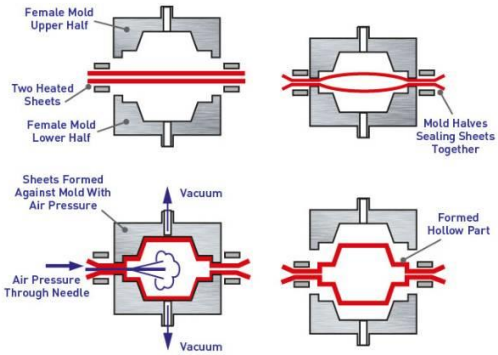
B. Hint Words: Functions of Breaker plate and Diagram [**5 Marks**] and Function of Screen pack with diagram [**5 Marks**] giving explanation about the location of each of them.

3 A. Working of 3-Plate Mold [**5 Marks**] and diagram with proper labelling [**5 Marks**]

B. 

Hint Words: Any 5 Troubleshooting like, Short-shot, sink marks, Flash, Shrinkage, warpage, poor weld lines viz [**5 Marks**] with probable causes and remedies [**5 Marks**]

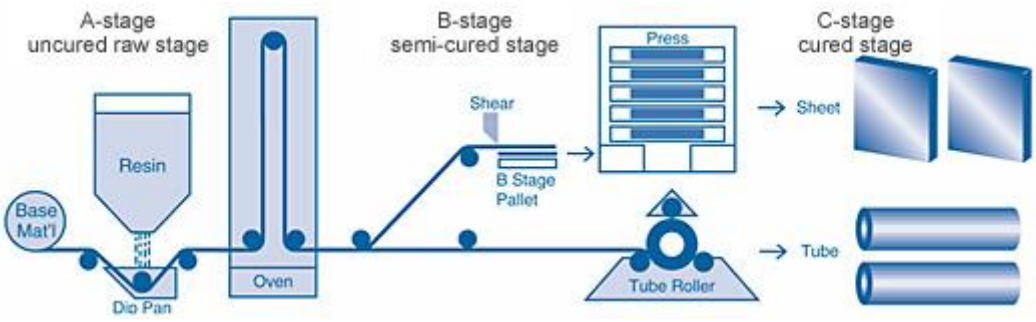
4 A. Hint Words: Enlist various types of thermoforming processes [**2 Marks**] explaining twin sheet thermoforming [**5 Marks**] and suitable diagram [**3 Marks**]



B. Hint Words: Enlist various types of rotational molding techniques – Rock-n-roll, Clamshell, Carousel type, shuttle type [**2 Mark**] explaining process [**5 Mark**] and suitable diagram [**3 Mark**]

5 A. Explaining the lamination process, Wet/Dry/ Extrusion lamination [**5Marks**]

And suitable diagram [**5 Marks**]



B. Compression molding techniques – Manual, Semi-Automatic, Fully automatic [5Marks] explaining any one process [**5Marks**]

6 A. Hint words: Band Heaters, Rod Heaters, Infrared, Pensile heaters, [**2 Marks**] Explaining any 2 carries 3 Marks

B. Hint Words: Machine Direction wrinkles, Film tension bands, Hazy film, Uneven thickness, Voids/air bubbles in sheet, Contamination on sheet [**3 Marks**] and suitable cause and remedy [**2 Marks**]

C. Hint Words: Heat/Temperature, Pressure (air/pneumatic), Time, Information of the Material to be processed [**4 Marks**] explaining logical reasoning [**1 Mark**]

D. Clamp force is required in order to keep the mold closed during the injection process, which is the primary purpose of the clamp unit. injection mold clamp force required for a specific product is determined by finding the projected area of that product [Projected area = length x width] and multiplying that area by an injection mold clamp factor of between 2 and 8. [3 Mark] and L/D ratio - A critical factor involved in creating available injection pressure is the ratio of the length of the injection screw divided by the diameter (L/D). The length of the screw is measured over the entire flighted section, and the diameter is measured over the maximum diameter of the flights. The standard minimum L/D ratio is 20:1, while 24:1 is more desirable. [**2 Marks**]

E. Hint word: Explaining the Stretch blow molding technique [**3Marks**] and Injection stretch blow molding diagram [**2 Marks**]