MECHANICAL ENGINEERING DEPARTMENT

MEL 792- INJECTION MOLDING AND MOLD DESIGN

MAJOR, 9TH MAY. 2007, 1.00-3.00pm, 3LT4

Max marks 40

Note: Write brief and specific answers in given sequence only, no stories! Only points are valid as answers. Any other data, if required, can be suitably assumed and mentioned accordingly

Q1a) Determine the cooling requirement in tons of refrigeration for a hot runner mold for producing a Nokia Mobile product made of ABS and Nylon alloy (Cp = 0.35) weighing 28 gms in a 4 cavity mold at a 5 second cycle time. Assume the injection temperature to be 260°C, ejection temperature 70°C and room temperature 30°C. (4)

b) How a cooling layout can be designed and fabricated for the mold manufacturing a CD made of ABS in a single cavity, explain with a self-explanatory neat sketch for a 30 mm thick mold plate of 200mm Square. (4)

Q2.a) Derive the clamping force for a center gated disc of Radius 'R' with a melt pressure distribution at any radii 'r' given by

$$P_r = P_o [1-(r/R)^m]$$

Where, P_o is the melt pressure at the gate and 'm' is a material constant (also, m = (1-n), where 'n' is the index in the power law expression of polymer melt flow). (4)

b) If in place of disc, the product is a strip molding of length 'L' and thickness 't', show how the clamping force will be different. (4)

Q3.a) If no gate mark is allowed on the outside surface of a bottle cap having sharp and deep internal threads and no weld line is permitted on the threaded portion, can you visualize and draw the schematic layout of the cap with just core and cavity! (4)

b) What are collapsible cores, what is the material of their construction and when are they used. Can you explain its usage in an industrial product with a neat sketch! (4)

Q4.a) What do you understand by balanced gating; explain the situation with an example and also its remedy! (2)

b) What is gate vestige and protrusion?. How protrusion can be kept to a minimum in a practical way. (2)

c) What is implosion, its cause and remedy? (2)

d) Give one application of sleeve, shoulder, and valve headed ejector pins. (2)

Q5.What is the difference between a dogged cam actuation and a finger cam. If the external undercut is 7 mm in a molded part, what will be the length of a finger cam assuming the inclination angle (ϕ) is 15° and clearance between the pin and split hole is 0.5mm. (4)

b) Explain the limitations of Hele-Shaw model in flow predictions and the pitfalls in simulations and interpretation of analytical results, which model can predict /simulate the jetting phenomenon? (4)