MECHANICAL ENGINEERING DEPARTMENT

MEL 436 -792: INJECTION MOLDING AND MOLD DESIGN

MAJOR, 6TH MAY. 2010, 10.30-12.30pm,

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 cold runner mold for producing a bumper of a car made of PC-ABS alloy (Cp = 0.38) weighing 3Kg in a single cavity mold at a 3 minute cycle time. Assume the injection temperature to be 280°C, ejection temperature 90°C and room temperature 35°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. Three-polymer systems have been identified to design a component (equivalent to a column) for a below knee amputee orthotic application. The materials have the following properties and the reinforced stub tube may be subjected to all the three loads; tensile, compressive and flexural, which one of these will be more cost effective and for which load application: (7)

Material	Cost/kg	Flex. Modulus, MPA	Flex Strength, MPa	Elastic Modulus, MPa	Tensile/Compressive strength, MPA	Density, Kg/m^3
30% Glass reinforced Polypropylene	100	1600	60	1200	40	1200
20% glass Polyamide	250	2400	100	2000	80	1400
PEEK	580	5000	200	4000	120	1300

Q3.a) What is the difference between a dogged cam and a cam track actuation?

If the depth of a shaped part with external undercuts is 7.5 mm, what should be the length of the cam assuming the inclination angle (ϕ) is 18° and clearance between the pin and split hole is 0.3mm. Draw a neat sketch to show the movement. (7)

b) Explain the limitations of Hele-Shaw model in flow predictions and the pitfalls in simulations and interpretation of analytical results, which model(s) can predict /simulate the i)Jetting phenomenon, ii)Bubble growth in Mucell module iii)Warpage in fiber reinforced grade of polymer? (8)

Q4. Write brief conceptual notes on the following: (10)

i) Nano cellular foams
ii) Functionally graded materials by injection molding
iii) All electric IMM
iv) Micro Injection molding
v) MIM for medical implants