

MCL 133 NEAR NET SHAPE MANUFACTURING

Major

1-05-15 FRIDAY 8.00 -10.00 am

V 315

Answer all the questions. Be brief and specific in your answers. Wherever required, draw suitable sketches. PART A and PART B should be answered in separate answer booklets.

MCL133 - Part B (28 marks)

1. Write the difference between the casting processes involved for making a) jewel b) micro turbine (2+2)
2. List the mechanisms involved in particle manufacturing in mechanical milling (2)
3. Define the following : a) freezing ratio b) stuccoing c) permeability d) PoDFA (4)
4. List the problems associated with magnesium casting and discuss the remedies (1+3)
5. With a neat sketch, explain the fabrication process of a bimetallic tube having high strength outer layer and wear resistant inner layer. (4)
6. Explain the toughening mechanism of ceramic based composite & write on casting of CMC. (4)
7. The given modulus of the casting is 20mm. The length of the piping defect is 40mm. calculate the riser diameter and comment on the piping defect. (Make suitable assumptions and write the same in your answer) (4)
8. List the grain refining methods for light metal casting (2)

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MCL133 - Part A (14 marks)

Note: Be specific, concise and short in your answers, no stories, one sketch or figure is worth 1000 words.

- Q1. a) What is the major difference between an Injection Molding Machine and Die Casting? (1)
- b) Differentiate between dosing and packing concept in IM process. (1)
- c) List out all possible parameters that can affect the flow behavior of a polymer melt in a molding cavity? (1)
- Q2. a) Elaborate the reasons for i) shrinkage ii) warpage, could you make a figure to differentiate between the two? (1)
- b) Which mold design parameters can affect warpage behavior? (1)
- c) What precautions will you take to eliminate or minimize warpage in the front bumper of a car? (1)
- Q3. a) Give a visual example of injection speed profiling and layout for a tooth brush attached with a sprue, runner and gate during the filling process. (1)
- b) Why a MAD or MVD needed for starting the injection molding trials?(1)
- c) What are the major reasons of voids and sink marks, how a part designer, tool designer and a molder can avoid these as individual domain specialist. (1)
- Q4. Give an example of
- a) Homogeneous body that is not isotropic (1)
- b) Non homogeneous body that is isotropic (1)
- c) Derive the stiffness matrix elements C_{11} and C_{12} in terms of the Young's modulus and Poisson's ratio for an isotropic material? (1)
- d) Reduce the expression for (2)

$$Q_{11} = Q_{11} \cos^4 \theta + Q_{22} \sin^4 \theta + 2(Q_{12} + 2Q_{66}) \sin^2 \theta \cos^2 \theta$$

to

$$Q_{11} = U_1 + U_2 \cos^2 \theta + U_3 \cos^4 \theta, \text{ where } U_i, i=1,2,3 \text{ are the usual invariants.}$$

anisotropic

E_1

E_2

E_3

\dots