

Metal Casting Technology (MT 502)

Full Marks: 70

Time: 3 hrs

Part-A

1. Answer any Five (Compulsory): (5 x 3)
- Name two organic binder systems that are hardened at room temperature. What defects can arise in a casting from organic binders ?
 - Name the methods for treatment of molten steel casting and state why these steps are adopted
 - List the precautions required regarding composition for selection of charge (feed) materials for producing a melt to cast ductile iron with justification.
 - What is the function of an Inoculant? Name its constituents.
 - Why is 'ductile iron' ductile but grey cast iron is brittle ?
 - What are the types of induction furnaces ?
 - What is 'Modification' of Al-Si alloy? What is its function ?
2. Attempt any Three : (5 x 3)
- Name the steps involved (no figure is required) in i) Investment casting ii) Shell moulding
 - Explain the (i) application areas and (ii) special features of Pressure die casting process. Name two major differences between Pressure and Gravity die casting process.
 - What are the main limitations of a conventional cupola ? In what way a divided blast cupola is superior to it ?
 - Explain the role of Carbon Equivalent on the quality and properties of Cast irons.
 - Select suitable method of moulding and casting to produce: (i) 10,000 pieces of Zn- Al alloy castings per month, 200 gm each, per day on regular basis for six months (ii) 200 nos. of brass castings of complex and intricate shape, 10 kg each, requiring very good surface finish (iii) 10 pieces of cast iron bearing housing cover (iv) ductile iron castings, 12 kg each, for mass production (v) Cast iron plumbing component, 5 kg each, 600 nos.
3. Answer any two : [5 x 2]
- Name the different types of Cast irons. Describe the typical microstructures of cast irons.
 - What is ADI ? With a neat time-temperature diagram, briefly describe its heat treatment.
 - Briefly describe the treatment of the melt to produce ductile iron. Explain the importance of control of temperature and undesirable 'tramp' elements to
4. Explain why (any four) : [2 ½ x 4]
- Too high a pouring temperature is undesirable
 - Low Carbon Equivalent in cast iron melt result in hard carbides in thin sections of grey cast iron
 - Titanium boride or similar additives are added in melt of aluminium or its alloys
 - Iron oxide, saw dust , coal dust are added in moulding sand
 - Gas purging of melt and use of flux cover are essential melt treatments for many cast alloys.

Part-B

Write question No. 1 and any two from the rest

1. State the method for designing the optimum gating and feeding system for casting the symbol ' Δ ' using molten steel. The cross section of the all the arms is 10cm×10cm and length of the side arms is 100 cm. 15

(time co-efficient=1.3, flow co-efficient=0.3, Gating ratio is 1:2:1.5, Diameter of riser (D) =5.35×modulus for H=1.5D and D=6×modulus for H=D). Assume any other variable as required.

2. (a) Mention the considerations concerning conversion of the customer's drawing to pattern maker's drawing. 5

(b) Enumerate the physical principles considered in design of the gating system 5

3. (a) Justify the applicability of Chovorinov's rule in determination of solidification time considering the principle of unsteady heat transfer condition. 5

(b) What are the conditions to achieve directional solidification? 5

4. Write short notes (any two): 5×2
 - (a) Internal Chill
 - (b) Feeding distance
 - (c) Solidification modulus