

III B.Tech II Semester Regular Examinations, Apr/May 2006**FOUNDRY TECHNOLOGY**
(Metallurgy & Material Technology)**Time: 3 hours****Max Marks: 80****Answer any FIVE Questions**
All Questions carry equal marks

1. (a) Explain the color coding system that is being employed for patterns. [4]
(b) With the help of neat sketches Explain the following. [4X3=12]
 - i. Cope & drag pattern
 - ii. Follow Board pattern
 - iii. Gated pattern.
2. Explain in detail the properties desired for a good molding sand. [16]
3. (a) Explain the basic differences between die castings and other types of castings from the stand point of the methods by which they are made. [8+8]
(b) Describe briefly the various design features of die casting machines.
4. (a) For ease of molding it is decided to replace a spherical riser of diameter 100 mm by a cylindrical riser. Determine the size of the cylindrical riser that will have the identical solidification time. (Assume Blind risering).
{*Ratio of Height to Radius of Cylinder is 2 : 1*} [6+5+5]
(b) Compare the modulus method with that of CAINE's method for fixing the riser dimensions.
(c) What are the methods available to a casting designer to increase the casting yield -Explain them.
5. (a) Distinguish between long range freezing and short range freezing. [8+8]
(b) What is ingot segregation in castings. How it is controlled.
6. (a) Draw a simple sketch of cupola. Label the principle sections of the furnace. Describe briefly its operation. [9+7]
(b) Explain the necessary precautions to be taken during melting of Aluminium alloys.
7. Explain the following: [5+6+5]
 - (a) FURAN-no-bake binders
 - (b) Self setting silicate process
 - (c) Cold setting process
8. (a) Discuss the casting defects which may be directly attributed to the molding sand used for steel castings. Explain the remedial measure you adopt to overcome these defects. [10+6]

(b) What are sand expansion defects? How to eliminate or reduce them.

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1. (a) Define the term pattern. Explain how patterns differ from the drawing of casings. [8+8]
(b) Compare the advantages and disadvantages of metal casting with other metal processing techniques metal forming and metal joining methods.
2. (a) Explain the importance of coal dust in the foundry sand. [7+9]
(b) What is the need of core-print. What considerations are to be looked into the calculation of core-print size.
3. (a) Explain the basic differences between die castings and other types of castings from the stand point of the methods by which they are made. [8+8]
(b) Describe briefly the various design features of die casting machines.
4. (a) Explain why bottom pouring ladles are used for pouring the heavy castings. [4+6+6]
(b) State clearly the qualifications of ideal gating system.
(c) What are the limitations of NRL method? How would you overcome them.
5. (a) Derive an expression for critical nucleus size during nucleation. [8+8]
(b) Distinguish between progressive solidification and directional solidification.
6. Discuss critically the Aluminum and aluminium alloys foundry practice in the background of [4X4=16]
 - (a) Molding methods and materials
 - (b) Melting techniques and solidification
 - (c) gating and risering principles
 - (d) finishing and fettling operations.
7. What do you mean by continuous casting. What is the main principle of continuous casting. What are the different types of continuous casting method. Explain the relative merits and demerits of each of these methods. Explain any one method of continuous casting process with the help of a neat sketch. [16]
8. Mention the causes of the following sand casting defects: [4X4=16]
 - (a) Blow holes

- (b) Cold shuts
- (c) Metal penetration
- (d) Rat tails.

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1. (a) Among the various allowances provided on pattern which are positive allowances and which are negative allowances. Explain the reasons for the same with suitable examples. [7+5+4]
 (b) Explain the terms: (i) Cope (ii) drag (iii) CHEEK.
 (c) Explain the green in green sand molding.
2. Explain in detail the properties desired for a good molding sand. [16]
3. (a) Explain why investment casting process is so versatile as to shapes and produce excellent dimensional controls. [7+9]
 (b) Discuss the influence of different factors which affect the properties of CO_2 sands. Suggest suitable methods to improve the collapsibility of CO_2 molds.
4. (a) Discuss the Naval research method of rise ring. [5+5+6]
 (b) Why sprue's are made tapered: Explain its importance.
 (c) Sketch a gating system and label various components of the system.
5. (a) Distinguish fully between Homogeneous Nucleation and Heterogeneous Nucleation. [8+8]
 (b) Calculate the size of critical radius and the number of atoms in the critical radius the number of atoms in the critical nucleus when solid copper forms by homogeneous nucleation for the following data.
 Surface free energy $\sigma = 177 \times 10^{-3} J/m^3$
 Freezing temp of copper = $1085^\circ C$
 Latent heat of fusion = $1628 \times 10^6 J/m^3$
 Under cooling temp = $236^\circ C$
 Lattice parameter of Cu = 3.61 \AA
6. (a) How are the type of ladles chosen for any particular operation. [5+5+6]
 (b) What are the functions of flux in melting metals and alloys.
 (c) What are the causes for the change in the composition of the melt obtained from cupola.
7. What is full mold process. Explain the process fully. What are the advantages disadvantages and applications of the above process. [16]
8. What are the defects caused by the molten metal? Explain why they are formed. Explain how these defects can be avoided or minimized. [16]

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1. (a) Explain why is that a pattern is made in two or more pieces. Explain with typical example. [5+6+5]
 (b) When will you use match plate pattern and in what significant way does its design differ from that of an ordinary pattern.
 (c) Explain how the two values of a split pattern aligned.
2. (a) Explain the types or classification of molding sands. [6]
 (b) Explain the effect of clay content and temper water on the following. [10]
 (i) green compressive strength
 (ii) Permeability.
3. (a) Discuss the criterion for the selection of a centrifugal casting process. How do you find out the speed of rotation in a centrifugal casting process. [5+5+6]
 (b) Explain why steel castings are not made by pressure-die casting process.
 (c) Differentiate between centrifugal casting process centrifuging process.
4. (a) Generous risers are required for grey Iron casting -comment. [5+5+6]
 (b) What do you mean rising efficiency? & Explain.
 (c) Explain the factors that are considered while designing a riser.
5. (a) Distinguish fully between Homogeneous Nucleation and Heterogeneous Nucleation. [8+8]
 (b) Calculate the size of critical radius and the number of atoms in the critical radius the number of atoms in the critical nucleus when solid copper forms by homogeneous nucleation for the following data.
 Surface free energy $\sigma = 177 \times 10^{-3} J/m^2$
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6. (a) Describe with the help of a neat sketch the working of a hot-blast cupola. [8+8]
 (b) Distinguish clearly between malleable cast iron and spheroidal graphite cast iron with respect to microstructure; properties and applications.
7. What is full mold process. Explain the process fully. What are the advantages disadvantages and applications of the above process. [16]

8. What are the casting defects attributed for mishandling and bad preparation of cores? What are specific reasons for their occurrence? How could these defects be eliminated. [16]
