

M.E. METALLURGICAL AND MATERIAL ENGINEERING 1ST YEAR EXAMINATION, 2018
(2ND SEMESTER)

CASTING TECHNOLOGY

Time: Three Hours

Full Marks: 100

Answer Question No.1 and any five from the rest each carrying 16 marks.

1. Rewrite correct lines selecting right options with short justification: (Any 20 only)

1 x 20

- i. Nickel graphitises (a) more (b) less, in cast irons.
- ii. Silicon presence should be (a) optional (b) essential in grey cast irons.
- iii. Centrifugal castings produces (a) municipal pipes (b) Scooter handles to good perfection.
- iv. Hydraulic bond is (a) stronger (b) weaker than Electrostatic bond.
- v. The solidification time vs. (Vol / Area) line has gradient 2 in (a) log-log (b) Semi-log scale.
- vi. Modification of Graphite for S.G. iron should be done @ (a) lower (b) higher temperature.
- vii. White iron production needs Mn-control as (a) essential (b) optional requirement.
- viii. Foundry men prefer (a) top gating (b) bottom gating.
- ix. Increasing superheat will (a) increase (b) decrease, Misrun in castings.
- x. For brass casting Zinc flaring acts (a) beneficially (b) negatively for making sound castings.
- xi. Cupolas are generally lined with (a) silica (b) alumina bricks.
- xii. Induction furnaces use (a) medium (b) high frequency for steel melting.
- xiii. Increasing blast can (a) increase (b) decrease production of Cupola.
- xiv. In a Gating system, $S_A : R_A : G_A$ as 1: 2: 1, can be called as (a) Unpressurized (b) Pressurized.
- xv. For the same weight, plate shape would solidify (a) faster (b) slower, than spherical shape.
- xvi. Metals should be melted under (a) Reducing (b) slightly oxidizing atmosphere.
- xvii. Divided blast technology (a) reduces (b) increases coke rate in Cupolas.
- xviii. Coke bed Height (a) acts (b) does not act, as the heart of Cupola melting.
- xix. Phosphorous (a) reduces (b) increases fluidity in cast irons.
- xx. Phosphorous addition (a) increases (b) decreases dissolved oxidation in Bronzes.
- xxi. Too high bath carbon (a) helps (b) obstructs White iron production.
- xxii. During S.G. Iron production Mg is (a) directly (b) indirectly introduced into melt.
- xxiii. Modification of Silumin alloys produces (a) coarser (b) finer silicon streaks.
- xxiv. Sprues (a) should be (b) should not be tapered.
- xxv. Aluminium casting should use (a) higher (b) lower GFN silica sand.

2. Stating the basic assumptions in postulating Ruddle model of solidification for sand molds, derive the time of solidification in case of cylindrical castings.
3. Why pure metals solidify? Deduce from first principle the critical nucleus size and its relations with under cooling. Why heterogeneous nucleation is easy?
4. Asserting analytical approach of Neumann and its boundary conditions derive the time for solidification of a pure metal plate casting.
5. Describe Cast iron microstructures for different cast irons, with the associated relations of properties contributed by each element in cast irons.
6. Discuss manufacturing methods for different cast irons, stating each type. Why Buddha era Cupola is still relevant in producing Gray cast iron of 21st century?
7. State common production methods used in (a) Automobile Al-Wheels (b) Idlers for Belt Conveyors, (c) Municipal Water Pipes, (d) Single Crystal Turbine Blades for aero-engines.
8. Briefly describe principles for Gating Design and Riser Design with necessary application.
9. State Bonding mechanisms utilized in Foundry. Discuss at least four Casting defects.
10. Write short notes on: (a) Sand (Mold & Core) Properties (b) Non-ferrous Melting.