

**M.E. METALLURGICAL AND MATERIAL ENGINEERING 1ST YEAR EXAMINATION, 2017
(2ND SEMESTER)
CASTING TECHNOLOGY**

Time: Three Hours

Full Marks: 100

Answer Question No.9 and any five from the rest

1. Name some advanced Sand Moulding processes for producing modern engineering components and describe three of those with complete details. 1+3 x5 =16
2. What are basic properties of foundry sand for moulding and core making purposes? Describe how all of those can be measured in Sand Testing laboratories. 1+3 x5 =16
3. How structurally Silica sand and Bentonite differ? Why Base Exchange capacity is essential for common sand bonding? Explain the three bonding theories of foundry sand. 4+2+ 10
4. Deduce the relationship between supercooling and the critical nucleus size for pure metal solidification. Describe how the supercooling can be utilized in controlling grain size & rate of nucleation and growth rate in metal moulding, continuous casting and Splat cooling conditions with improving properties. 6 + 10
5. Describe the family of Cast Irons detailing the compositions and necessary microstructures. Write down the production methods of Grey Cast iron and Ductile iron. 10+6
6. Explain how much important are Centrifugal casting and Die casting for modern society. Describe two common Centrifugal casting and Die casting methods in each case. 2 + 2x7
7. Describe with advantages and limitations, i) Three machine moulding methods for sand casting, ii) Three Non-destructive testing methods for detection of defects in casting. 6 + 10
8. Write short notes on any two): i) Non-ferrous alloy melting, ii) Gating and Riser of castings, iii) Sand Casting defects. 8 + 8

9. Explain : (Any Twenty only) 1 X 20
 - I. Why high Silicon can be essential factor in free graphite formation in cast irons?
 - II. Why White cast iron parts should have thin sections?
 - III. Why brass castings can be more reliable than bronze castings?
 - IV. Why metals are melted in slightly oxidizing-atmosphere?
 - V. What is Master Pattern?
 - VI. Which two binders that do not need moisture for activation in sand molding?
 - VII. Why all Sprues are tapered?
 - VIII. Why spherical shape risers are not generally found in foundry?
 - IX. Why top pouring can make castings in poor quality?
 - X. Can you cite an example where sand is used for precision casting production?
 - XI. Why does silica crystal structure become tetrahedron?
 - XII. Why Optimum moisture for any Bentonite percentage is fixed in any particular sand grains?
 - XIII. How modification of Silumin alloys increase the strength of the castings?
 - XIV. Why sea coal cannot be added in sand for steel castings?
 - XV. Why Na-Silicate process is used for heavy ferrous castings?
 - XVI. What type of castings do you suggest for Sweep patterns?
 - XVII. Why metal patterns are used in Shell molding?
 - XVIII. Can you name an alloy that is known for high damping capacity?
 - XIX. Why Liquid forging can make car wheels of aluminum alloys very strong?
 - XX. What is the role played by Phosphorous in copper alloy melting?
 - XXI. Why Divided Blast can decrease Coke consumption in Cupola?
 - XXII. Can you make a casting without pattern?
 - XXIII. What kind of allowance is needed for withdrawing pattern in sand molds?
 - XXIV. How many types [at least three] of sand [except Silica] do you know?
 - XXV. Why Eddy current testing is not widely used in all NDT cases?