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 Risering 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?**