

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2020

Course Code: ME365**Course Name: ADVANCED METAL CASTING**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer any three full questions, each carries 10 marks.*

Marks

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| 1 | a) Explain the following types of sand used in casting process.
(1) Green sand (2) Loam sand (3) Parting sand | (3) |
| | b) With neat sketch explain the following sand testing techniques
(1) Moisture content test (2) Grain fineness test | (3) |
| | c) Explain the following properties of moulding sand.
(1) Refractoriness (2) Dry strength (3) Hot strength (4) Flow ability | (4) |
| 2 | a) Explain the term "mould wall movement". List any 4 causes of mould wall movement. | (3) |
| | b) List any 4 advantages and disadvantages of sand casting process. | (4) |
| | c) Write short notes on mould surface coatings. List any 4 functions of mould surface coatings. | (3) |
| 3 | a) With neat sketch explain the basic elements in a Gating system. | (4) |
| | b) In a gating system the mould dimensions are 50X25X15 cm, cross sections of the gate are 5cm ² and height of the liquid metal above the gate is 15 cm. Find the time required to fill the cavity by using top and bottom gating. | (4) |
| | c) List any 4 functions of risers. | (2) |
| 4 | a) What are the uses of chills, insulators and exothermic compounds? | (3) |
| | b) A cylindrical riser must be designed for a sand casting mould. The casting itself is a steel rectangular plate with dimensions 7.5 cm X 12.5 cm X 2 cm. Previous observations have indicated that the solidification time for the casting is 1.6 Minute. The cylinder for the riser will have a diameter to height ratio as 1. Determine the dimensions of the riser so that its solidification time is 2 minute. | (4) |
| | c) Explain the hydraulic principles involved in Gating system design. | (3) |

PART B

Answer any three full questions, each carries 10 marks.

- 5 a) Define the term Fluidity of molten metal. Explain various factors influencing fluidity. (4)
- b) With neat sketch explain any 3 degassing methods (4)
- c) Explain the term “molten metal treatment” in casting process. (2)
- 6 a) A casing of size $200 \times 100 \times 70 \text{ mm}^3$ solidifies in 10 Minute. Estimate the time for solidification of $20 \times 100 \times 10 \text{ mm}^3$ casting under similar working conditions. (3)
- b) With neat sketch explain directional and progressive solidification. (3)
- c) With the help of cooling curve explain the solidification of pure metal. (4)
- 7 a) Explain the different methods of manipulating heat transfer during solidification (3)
- b) With neat sketch explain the following crystal growth methods (4)
- (1) Bridgmann technique (2) Vernuil method
- c) Explain the heat transfer process from the sand mould in casting process. (3)
- 8 a) What is meant by the term nucleation? Explain homogeneous and heterogeneous nucleation. (6)
- b) Explain the following terms (4)
- (1) Riser effect (2) End effect

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) List any 6 applications of Grey Cast Iron. (3)
- b) With suitable example explain different aluminium alloy systems. (7)
- 10 a) Explain alloy steel with suitable example. List any 3 industrial applications of alloy steel. (5)
- b) Explain flux and flux less melting of Mg alloys. (5)
- 11 a) List any 4 advantages of Cu alloys. (4)
- b) Explain any 3 grain refinement methods of Al alloys. (6)
- 12 a) What are the metallurgical design considerations in casting? (3)
- b) With neat sketch explain the following non-destructive testing in casting. (7)
- (1) X Ray radiography test (2) Dye penetrant testing

- 13 a) Explain the term “Quality control and Quality assurance” in casting. (5)
b) Explain the functional design of casing. (5)
- 14 a) With suitable sketch explain the following casting defects. (6)
(1) Misrun (2) hot tear (3) Rat tail (4) shrinkage cavity
- b) Explain the economic considerations in the design of casting. (4)
