

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

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) Discuss the various types of moulding sand (any five). | (5) |
| | b) What are the functional requirements of moulding sand? | (5) |
| 2 | a) What do you mean by mould wall movement? What are the causes and methods for prevention? | (5) |
| | b) List down the constituents of moulding sand. Mention its functions. | (5) |
| 3 | a) A 200 mm long down sprue has an area of cross section of 650 mm^2 where the pouring basin meets the down sprue. A constant head of molten metal is maintained by pouring basin. The molten metal flow rate is $6.5 \times 10^5 \text{ mm}^3/\text{s}$. Considering the end of down sprue to be open to atmosphere, and an acceleration due to gravity of 10 m/s^2 , the area of the down sprue in mm^2 at its end to avoid aspiration should be how much? | (7) |
| | b) What do you mean by gating ratio? Explain with the help of an example. | (3) |
| 4 | a) What do you mean by Chvorinov's Rule? Explain its application in the design of risers. | (5) |
| | b) A steel plate $40 \text{ cm} \times 30 \text{ cm} \times 0.3 \text{ cm}$ is to be cast. The volume shrinkage of steel during solidification is 3%. A cylindrical side riser with diameter 4 cm and height 4 cm is used. The riser volume should be at least 3 times the shrinkage volume. Is the riser volume sufficient, if not what is the riser size? | (5) |

PART B

Answer any three full questions, each carries 10 marks.

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| 5 | a) Explain the solidification of alloy with the help of suitable diagram. | (6) |
| | b) What do you mean by nucleation? Explain different types of nucleation. | (4) |
| 6 | a) Write notes on evolution of gas during casting. What are its consequences? | (4) |
| | b) Explain different methods used for degassing. Also write the relationship between concentration of dissolved gases and partial pressure of gas. | (6) |

- 7 a) Write notes on heat transfer at metal-mould interface. (5)
b) With the help of diagram show transition of growth in castings. (5)
- 8 a) What do you mean by segregation? (3)
b) Mention any three methods to improved heat transfer in casting process. (3)
c) What do you mean convection in casting? How does it affect the grain structure? (4)

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) Explain Electric arc melting process. (5)
b) Write short notes on: (5)
i) Cementite
ii) Pearlite
- 10 a) What are the elements added to aluminium during casting? Also write its function. (4)
b) With the help of labelled diagram explain Al – Si equilibrium diagram and explain. (6)
- 11 a) What are the advantages of copper alloy castings? (3)
b) Explain the melting process of copper? Also explain degassing of copper. (7)
- 12 a) Write notes on different types of cast iron. (any five) (5)
b) With the help of suitable diagram explain solidification of cast iron. (5)
- 13 a) Explain: (10)
i) Pin holes
ii) Swell
iii) Shifts
iv) Metal penetration
v) Shifts
- 14 a) Write notes on die penetrant test. (3)
b) Explain magnetic- particle inspection. (4)
c) Write notes on metallurgical inspection. (3)
