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B.Tech
PCMT4305

6th Semester Regular / Back Examination 2015-16
SOLIDIFICATION AND CASTING
BRANCH: METTA, MME
Time: 3 Hours
Max Marks: 70
Q.CODE:W340
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**
a) What is Chvorinov Rule?
b) What properties are desirable of moulding sand from the stand point of sound casting?
c) What do you mean by equilibrium solidification ?
d) What is master pattern?
e) Growth and undercooled pure materials is by ----------- & dendrites which are formed from thermal undercooling alone is term as ------------ .
f) During cooling the temperature curve of an alloy where solidification starts is called ----------- and the temperature curve where solid metal starts to liquidified is called ----------.
g) Is eutectic freezing slower than peritectic freezing? Justify your answer.
h) Is superheat required for melting? Justify your answer.
i) Find out the size of critical nucleus for homogeneous nucleation if the tiny solid formed is a cube? The length of cube is 'a'.
j) What is shell-investment casting?

Q2 a) Explain Constitutional Super Cooling. **(5)**
b) Derive an expression to find out the critical radius for homogeneous nucleation, assuming the nucleating solid is a sphere. **(5)**

Q3 a) Describe the concept of solidification of metal. **(5)**
b) Explain the solidifications of pure metaland alloy with preferable cooling curves. **(5)**

Q4 Discuss the casting defects which may be directly attributed to the moulding sand and pouring metal used for steel casting. Explain the remedial measures you would like to adopt to overcome these defects. **(10)**

Q5 **a)** Define gating ratio and explain its importance in relation to flow distribution in different kinds of gating system. **(5)**

b) Explain in brief the types of gating systems used and their advantages and limitations. **(5)**

Q6 **a)** Describe the kinetics of continuous growth with preferable free energy curves. **(5)**

b) What is lateral growth? Differentiate the continuous growth and lateral growth. **(5)**

Q7 **a)** Describe the industrial melting practices that are adopted for the melting of cast iron? **(5)**

b) Estimate the number of crystal like clusters in $1mm^3$ of copper at its melting point for spherical clusters containing 60 atoms? The atomic volume of liquid copper is $1.6 \times 10^{-29} m^3$, γ_{sl}(surface energy)=$0.177 J/m^2$, $k=1.38 \times 10^{-23} JK^{-1}$, $T_m = 1356K$ **(5)**

Q8 Write short notes on any two: **(5 x 2)**
a) Dendritic solidification
b) Growth by screw dislocation.
c) Segregation in castings.
d) Vacuum sealed casting