Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
PCMT4305

6th Semester Back Examination 2017-18
SOLIDIFICATION AND CASTING
BRANCH : METTA, MME
Time : 3 Hours
Max Marks : 70
Q.CODE : C562

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Attempt all parts of a question at a place

Q1 **Answer the following questions :** **(2 x 10)**

a) What do you mean by equilibrium solidification?
b) Draw a graph between total free energy of a spherical nucleus as a function of its radius at different temperatures, these temperatures are $T_m > T_1 > T_2 > T_3$?
c) What do you mean by dendrite?
d) Mention two characteristics of core.
e) Define super cooling.
f) What do you mean by lost wax process?
g) List out the properties required for moulding materials.
h) Define liquidus and solidus line.
i) Define microsegregation.
j) Write the ratio of pressurized and un-pressurized gating system.

Q2 **a)** Derive an expression to find out the critical radius for homogeneous nucleation, assuming the nucleating solid is a sphere. **(5)**
b) Discus the significance of Ellingham diagram over casting process. **(5)**

Q3 **a)** Explain Constitutional Super Cooling. **(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)**

Q4 **a)** What is meant by casting yield and what are the methods available to a casting designer to increase the casting yield? **(5)**
b) Define gating ratio and explain its importance in relation to flow distribution in different kinds of gating system. **(5)**

Q5 **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)**

Q6 **a)** Explain the types of mould and mould materials. **(5)**
b) What are the significance of pattern allowances during the mould making process? **(5)**

Q7 Discuss the casting defects attributed to the moulding sand and pouring metal used for casting. Explain the remedial measures you would like to adopt to overcome these defects. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Growth by screw dislocation.

b) Vacuum sealed casting.

c) Solute partitioning.

d) Centrifugal casting.