B.E. Part III (MET) 6th Semester Final Examination, 2012

Subject : METAL CASTING TECHNOLOGY [MT 606]

Full marks: 70 Time: 3h

First half

1. Attempt any **Two** :

(i) Explain the utility of *constant volume* condition, *Bernoulli's* equation and *Stokes* law for maintaining steady state flow of clean liquid metal within the mould cavity. (4+4+4)

(ii) Enumerate the purpose of directional solidification. Explain the utility of Chvorinov's rule in achieving the same. Calculate the modulus of a hollow cylinder having thickness T and height H. (4+4+4)

(iii) What is the purpose of Chill? Obtain the volume of internal chill. Discuss the precautions to be considered in the case of incorporating the external chill. (4+4+4)

2. Attempt any **One**

(i) Determine the optimum number of risers in the case of a circular ring having the cross section 50cm×50cm and the inner diameter of 200cm. Also suggest the design of the ingate system with a schematic drawing mentioning the reasons. 7+4

(ii) Design the optimum feeding system for a casting having the shape of the letter E. The dimension of all the casting is 25cm×25cm. length of all the arms is 100cm. 11

Second half

ANSWER ALL THE QUESTIONS

1. Attempt any **Three** : [3 x 3]

a) Name the pattern materials for (i) Shell moulding and (ii) Lost Foam process ;and justify the usage of these pattern materials

b) Explain how defects can be produced in castings due to (i) improper pattern design and (ii) improper sand ramming pressure

c) Compare the (i) die design, die material and (ii) application areas of Pressure die casting and Gravity die casting

d) Compare and contrast : i) True centrifugal and Semi-centrifugal casting

e) State the functions of (any two) : (i) Core print (ii) addition of saw dust in sand mix (iii) addition of ferro-silicon and calcium carbide to produce steel melt in EAF

2. Attempt any **Two** ; [2 x 7]

a) List the different types of induction furnaces that are in use in foundries according to frequency. Explain why the coreless induction furnaces have increasing popularity for production of melts of ductile and alloy cast iron, as well as non-ferrous alloys.

b) (i) Name one melt treatment each for ferrous and non-ferrous alloys, briefly stating the steps, the objectives and the final cast structure obtained after treatment. (ii) What casting defects may arise due to too high a pouring temperature

c) Select, with brief justification, casting processes to produce any two of the following : (i) two nos. of steel castings of good surface finish (iii) 5000 bronze castings with excellent finish (iii) 5000 pieces of zinc-magnesium alloy per month for 6 months

c) State the quality control measures required to produce ductile iron, starting from scrap quality, composition and treatment

3. Write briefly on any **Three** : [3 x 4]

(i) Dendrite formation (ii) Rheocasting (iii) Mechanism of bonding in clay-water system
(iv) Ni-hard cast iron (v) ADI (vi) Fish- bone diagram for quality control