Menofiya University
Shebin El- Kom
Faculty of Engineering
Final Exam.(2nd term)
Total Mark : 70

Fourth Year
Department: Production Engineering
Subject: Casting of Engineering (PRE 424A)
Time Allowed: 3 hrs.
Date:3/6/2014

Note: Any data required, but not given, may be reasonably assumed.
This exam. measures ILOs no. (a1, a3, b6, b13, c5, c15 c4, d1, d9)

Question1

(15 Mark)

In a foundry, it was required to obtain a cast iron with the following composition: carbon 3.2 – 3.6% silicon 2.3 – 2.6%; manganese 0.6 – 0.8%; sulfur 0.08% maximum; and phosphorus 0.4 – 0.6%. If the following raw materials are available as shown in Table (1). The oxidation losses silicon as 10% and that of manganese as 20% ; the carbon pick up assumed as 0.15% and the sulfur pick up as 0.05%. Estimate the best charge properties.

Table (1)

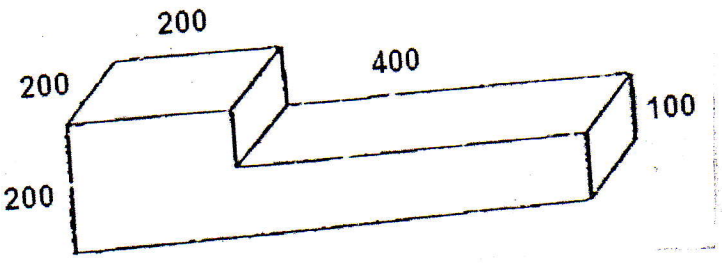
Raw Material	%C	%Si	%Mn	%P	%S
Pig Iron 1	3.5	3.00	1.0	0.4	0.02
Pig Iron 2	3.2	1.5	0.5	0.8	0.01
Pig Iron 3	3.5	2.5	0.8	0.5	0.02
Scrap 1	3.50	1.82	0.3	0.25	0.02
Scrap 2	0.28	0.65	0.2	0.01	0.001
Ferrosilicon		50.0			

(20 Mark)

Question2

a) Discuss the main function of a gating system showing the design requirements of proper system. Explain with drawings four different designs of gates.
b) Discuss the use of chills in making castings and show with sketches the effect of chill on feeding distance.
c) Discuss two methods for determining the riser dimensions.
d) Calculate the riser dimensions for the casting shown in the following figure in two methods. $H' = (3/2)D'$

1) Consider the casting to be in simplified form as .shown in Fig. 1.
2) Consider the thick part as main casting and the thin part as a casting-branch.



Dims.in mms.

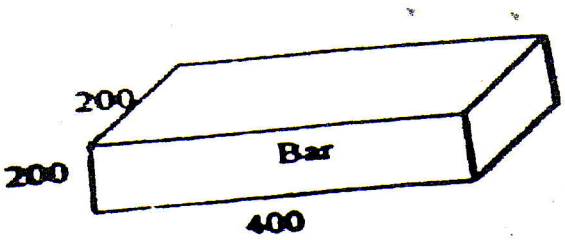


Fig.(1) Equivalent Casting

(15 Mark)

Question3

a) Define the following terms:
Average grain size – Uniformity factor- permeability number – GFN
b) What are the basic pattern design criteria? Discuss them with examples.
c) Describe the various types of core boxes. What are the usually allowances given on them.
d) Explain with examples in what circumstances casting will prove to be the most economical manufacturing process.
e) Enumerate the main advantages of the casting processes over other methods of fabrication.

Question4 (20 Mark)

A sample of foundry sand was tested and the following results were obtained :

a- Weight of sample = 50 gm.

b- Weight of sample after drying = 47.8 gm.

c- Weight of sample after clay separation by sodium hydroxide solution = 38.2 gm.

d- When a standard specimen was tested for permeability, it was found that a volume of air of 2000 cm^3 was passed through the specimen in a period of 30 sec. under a pressure of 3.5 cm water.

e- A sand sample of 50 gram was taken for sieve analysis and the results were listed in Table (2).

It is required to determine the following sand properties:

1-Clay content 2-Moisture content 3- Permeability number

4- GFN grain fineness number 5- Draw the cumulative curve on a semi - log. scale. Discuss the meaning of the curve and determine the average grain size and uniformity factor.

Table (2)

Sieve No.	Multiplication factor	Sieve opening, mm	Weight of sand retained On each, gm.
6	3	3.327	---
12	5	1.651	---
20	10	0.833	0.5
30	20	0.589	1.2
40	30	0.414	4.1
50	40	0.295	4.4
70	50	0.208	4.0
100	70	0.147	5.1
140	100	0.104	2.1
200	140	0.074	1.7
270	200	0.053	0.9
Pan	300	---	The rest

Good luck

ALLOWABLE CHARTS

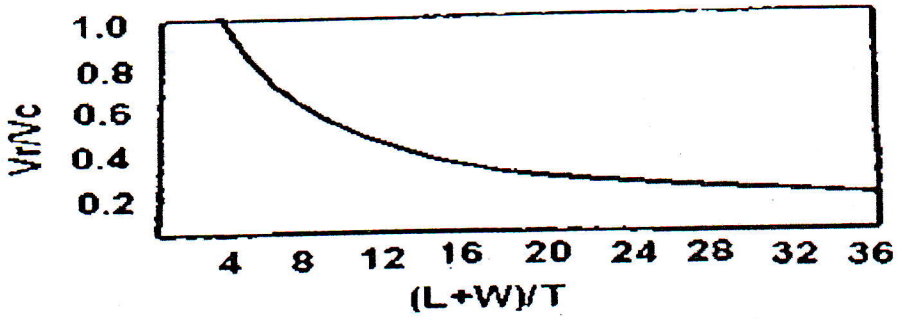


Fig.1

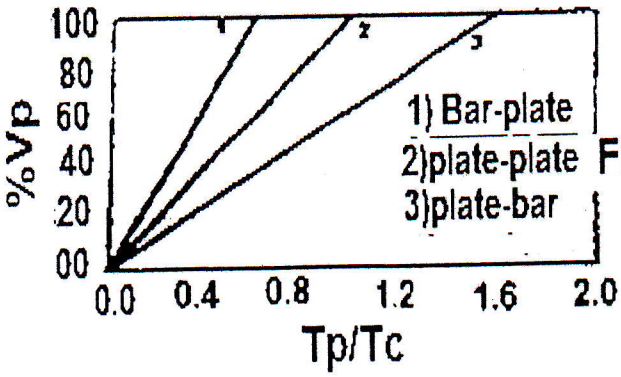


Fig.2

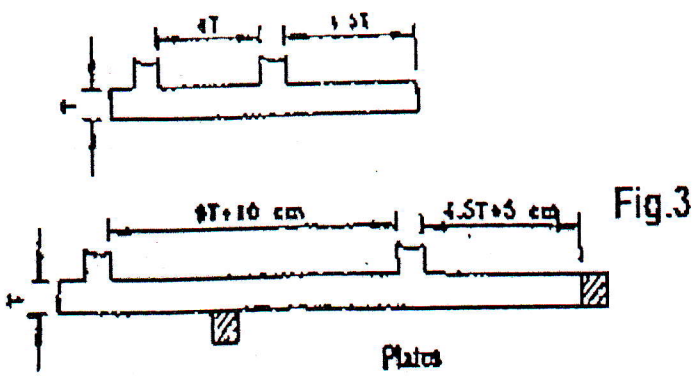


Fig.3