Prince of Songkla University
Faculty of Engineering

Midterm Examination : Semester II   Academies Year : 2006
Date : December 20,2006   Time : 09.00-12.00
Subject : 226-508 Heavy Industrial Furnace   Room : R300

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ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้นและพักการเรียน 1 ภาคการศึกษา

Instructions :
1. Do all questions of 20.
2. Each of no. 1-18 scores 4 and the marks of others appear at the end of problems.
3. Total score is 100.
4. You must answer on the questions sheets.
5. During the time of exam, you are not allowed to ask anyone.
6. Calculator, book and notes are allowed.
7. Put your name and ID on every page.

Asst.Prof.Sane   Thanthadalug

1. A, B, C and D are 4 bricks with same ceramics. The bulk densities and apparent porosities of A, B, C and D are 2.95, 2.90, 2.95 , 2.85 g./cc and 30, 32, 28, 31 %. What should be used for lining blast furnace?

2. A, B and C are refractory piece, insulating firebrick and ceramic fiber, respectively with same material. What should be used for lining ceramic kiln under energy savings?

3. Tell me the commercial name of heating element which can be used at 1800 $^{\circ}$C in a resistance furnace. What is its chemical name?

4. Why is carborundum qualified for using as crucible material?

5. What is the difference between a crucible and a ladle?

6. Write down the chemical reaction which produce iron in blast furnace?

7. What is the chemical reaction in zinc ore smelter?

8. How many types of refractory material is used for lining the electric kiln of 1800 $^{\circ}$C?

9. What is the major factor of heating wire that can provide high efficiency of resistance furnace?

10. How many types of zinc ore smelter? What are they?

11. What is the outcome of zinc ore extraction at high temperature?

12. What are charged into blast furnace?

13. Where does the maximum temperature of blast furnace occur?

14. What is the chemical composition of molten iron at the bottom of blast furnace?

15. Why is limestone charged into the furnace for iron ore extraction?

16. With what is the bottom of blast furnace lined?

17. A and B are vacuum and normal heat-treatment furnaces. Why is the efficiency of B higher than A?

18. How many types can you put Kanthal A-1 coil in heat-treatment furnace? What are they?

19. Given $SL = 5.25$ W/cm^2, $SA_e = 80$ cm^2, $A_1 = 1.08$ and $A_2 = 3.18$ m^2, K_1 and $K_2 = 0.72$ and 0.15 W/m^{o}C, L_1 and $L_2 = 7$ and 23 cm., $\Delta T = 1775$ ^{o}C and the door loss = 100%.

Find :
    (a) R.   (6 marks)
    (b) the power of furnace.   (6 marks)
    (c) the amount of heating U-bars.   (6 marks)

20. Given the power of furnace = 18 kW. and the diameter of Kanthal A-1 = 2.0 mm.

Find :
    (a) the mass of heating wire.   (5 marks)
    (b) the surface load.   (5 marks)