



Final Exam

تنوية: أجب عن كل سؤال بهذه الورقة في صفحة منفردة بورقة الاجابة

I. Answer the following questions: (40 Point)

1. Explain with drawing the effects of alloying element on eutectoid temperature?
2. Briefly mention the differences between pearlite and bainite relative to microstructure and mechanical properties?
3. The plain carbon steels are typically classified into three groups according to their carbon content. Discuss?
4. Stainless steels are traditionally divided into three groups, named for the predominant phase present in the alloy at ambient temperature. Discuss?
5. Why annealing is performed to steel?
6. What are the properties of copper that determines most of its applications?
7. 2024-T6, 2024; are two different Aluminum alloys. Differentiate between each other's?
8. What are the major classifications of composites?
9. The figures below show different microstructure of cast iron. Specify each type?



(a)



(b)



(c)

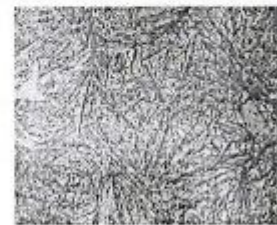
10. The figures below show different microstructure examinations of different types of steel alloys after specific heat treatments for each one. Specify the phases of these alloys?



(a)



(b)



(c)



Final Exam

تنويه: هذه الصفحة يتم إرفاقها مع ورقة الإجابة

II. Choose the correct answer in the following multiple choice questions: (15 Point)

1. Martensite with More than 0.6% C and have fine structure of parallel twins is called.
(a) Plate martensite, (b) Lath martensite, or (c) mixed martensite
2. Metastable phase consisting of super saturated solid solution of C in BCC or BCC tetragonal iron is:
a) Martensite, (b) Ferrite, or (c) Pearlite
3. Ductile cast iron is formed by special melting and pouring treatment of:
a) Grey cast iron, (b) Malleable cast iron, or (c) White cast iron
4. The principal alloying element in stainless steel is:
a) Magnesium, (b) Chromium, or (c) Boron
5. Which of the following codes are one of wrought aluminums codes:
(a) 5XX.X, (b) 5.XXX, or (c) 5XXX

III. Complete by the scientific name: (15 Point)

1. The three major classes of matrix materials for Composites are.....,, and..... .
2. A process at which steel is heated in austenite region and cooled in air is called..... .
3. At..... process the sample is heated to 40°C above austenite ferrite boundary, held for necessary time and cooled slowly.
4. At temperature between 250-350°C in the IT diagrams for an iron carbon alloy, the intermediate structure produced is called..... .
5. Zinc (0.5 to 3%) is always added to copper to increase..... .

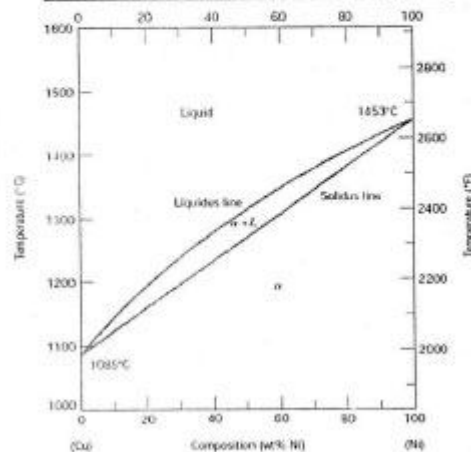


Final Exam

تنويه: هذه الصفحة يتم ارفاقها مع ورقة الاجابة

IV. Solve the following problem: (30 Point)

- Using the copper–nickel phase diagram shown, Calculate the amount of each phase present in 1 kg of a 50 wt.% Ni–50 wt.% Cu alloy at:
 - 1400°C,
 - 1300°C and
 - 1200°C.



- Using the isothermal transformation diagram for an iron–carbon alloy of eutectoid composition shown below, and then specify the nature of the final microstructure of a small specimen that has been subjected to the following time-temperature treatments. In each case assume that the specimen begins at 760°C and that it has been held at this temperature long enough to have achieved a complete and homogeneous austenitic structure. (Don't touch the nose of C-Curve)
 - Rapidly cool to 350°C, hold for 10^1 s, and quench to room temperature.
 - Rapidly cool to 250°C, hold for 10^2 s, and quench to room temperature.
 - Rapidly cool to 650°C, hold for 20 s, rapidly cool to 400°C hold for 10^3 s, and quench to room temperature.

