UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	MATERIALS SCIENCE
COURSE CODE	:	BPC 3053
PROGRAMME	:	4 BPB
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. ATTACH **APPENDIX I, II, III, IV** AND **V** WITH YOUR ANSWER BOOKLET

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

Q1 (a) Sketch plane and direction the following unit cell:

(i) $(3\bar{1}3)$

(ii) (201)

(iii) [304]

(iv) $[\bar{2}01]$

(8 marks)

(b) Determine the plane in Figure Q1(a) and direction in Figure Q1(b).

(4 marks)

(c) i) List **SIX (6)** from seven of crystal structure
ii) State **TWO (2)** Bravais Lattice for cubic

(8 marks)

Q2 (a) (i) State the differences between elastic formation and plastic deformations.

(4 marks)

(ii) List **TWO (2)** materials that undergo plastic deformation only.

(2 marks)

(b) Consider the stress strain diagram in Figure Q2. Determine;

(i) Young Modulus (E)
(ii) Yield strength at strain offset 0.002
(iii) Tensile strength
(iv) Percentage of elongation when the material is fractured.

(14 marks)

Q3 (a) State **TWO (2)** differences between interdiffusion (impurity diffusion) and self diffusion.

(4 marks)

(b) Explain **FOUR (4)** from the list below:

(i) Low Carbon Steels
(ii) Medium Carbon Steel
(iii) High Carbon Steel
(iv) Stainless steel
(v) White Cast Iron
(vi) Gray Cast Iron
(vii) Aloi Titanium

(8 marks)

(c) Illustrate **TWO (2)** of the following imperfections with explaination;

(i) Vacancy (Schottky defects)
(ii) Interstitial (Frenkel defects)
(iii) Substitutional impurity atom

(8 marks)

Q4 Consider 4.0 kg copper alloy (Cu) with 25% Argentum (Ag) in Cu-Ag phase diagram as shown in Figure Q4, Appendix III.

(a) Make phase analysis with state the phase present and composition (%) of the phases and the total phase weight.

(i) $779^{\circ}C + \Delta T$

(ii) $900^{\circ}C$

(11 marks)

(b) Define the meaning of eutectic, peritectic and eutectoid reaction.

(9 marks)

Q5 (a) State the phases present in Fe-Fe_3C phase diagram as shown in Figure Q5(a) in Appendix IV.

(6 marks)

(b) Figure Q5 (b) shows TTT diagram for a 0.6%C steel alloy. Illustrate with label the expected cooling rate if the steel is subjected to the following process:

(i) Annealing
(ii) Normalizing
(iii) Oil-quenched
(iv) Water-quenched

(6 marks)

(c) Explain **TWO (2)** of the following process:

(i) Tempering process
(ii) Cold work process
(iii) Recovery process
(iv) Recrystallization process

(8 marks)

END OF QUESTION PAPER

Appendix I

FINAL EXAMINATION

SEMESTER/SESSION : *SEM II* / 2011 2012
COURSE : MATERIALS SCIENCE

PROGRAMME : 4 BPB
COURSE CODE : BPC3053

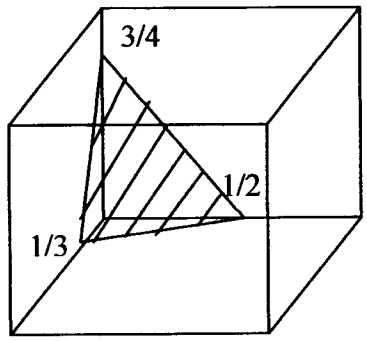

Figure Q1(a)

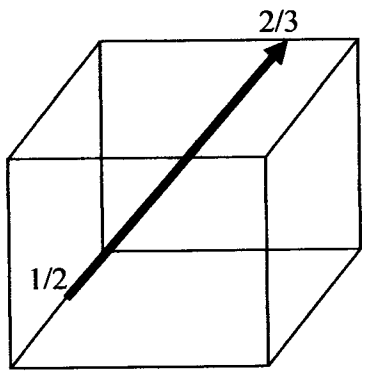

Figure Q1(b)

Appendix II

FINAL EXAMINATION

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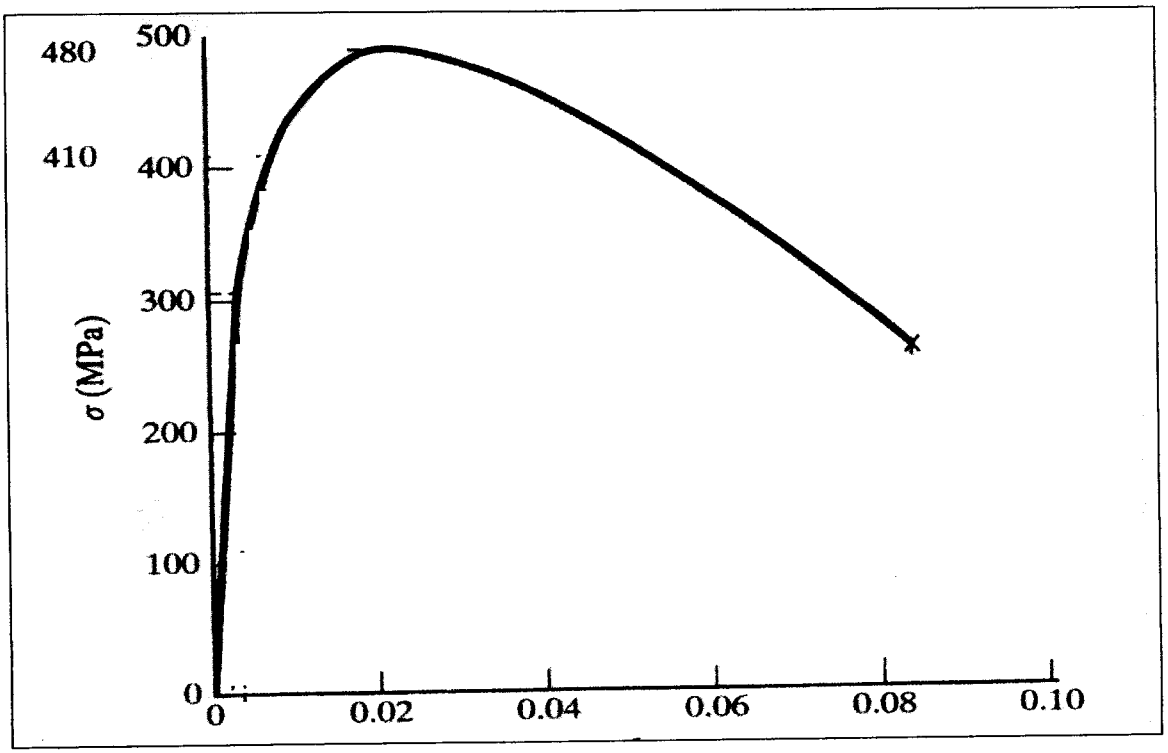

Figure Q2: Stress – strain diagram.

Appendix III

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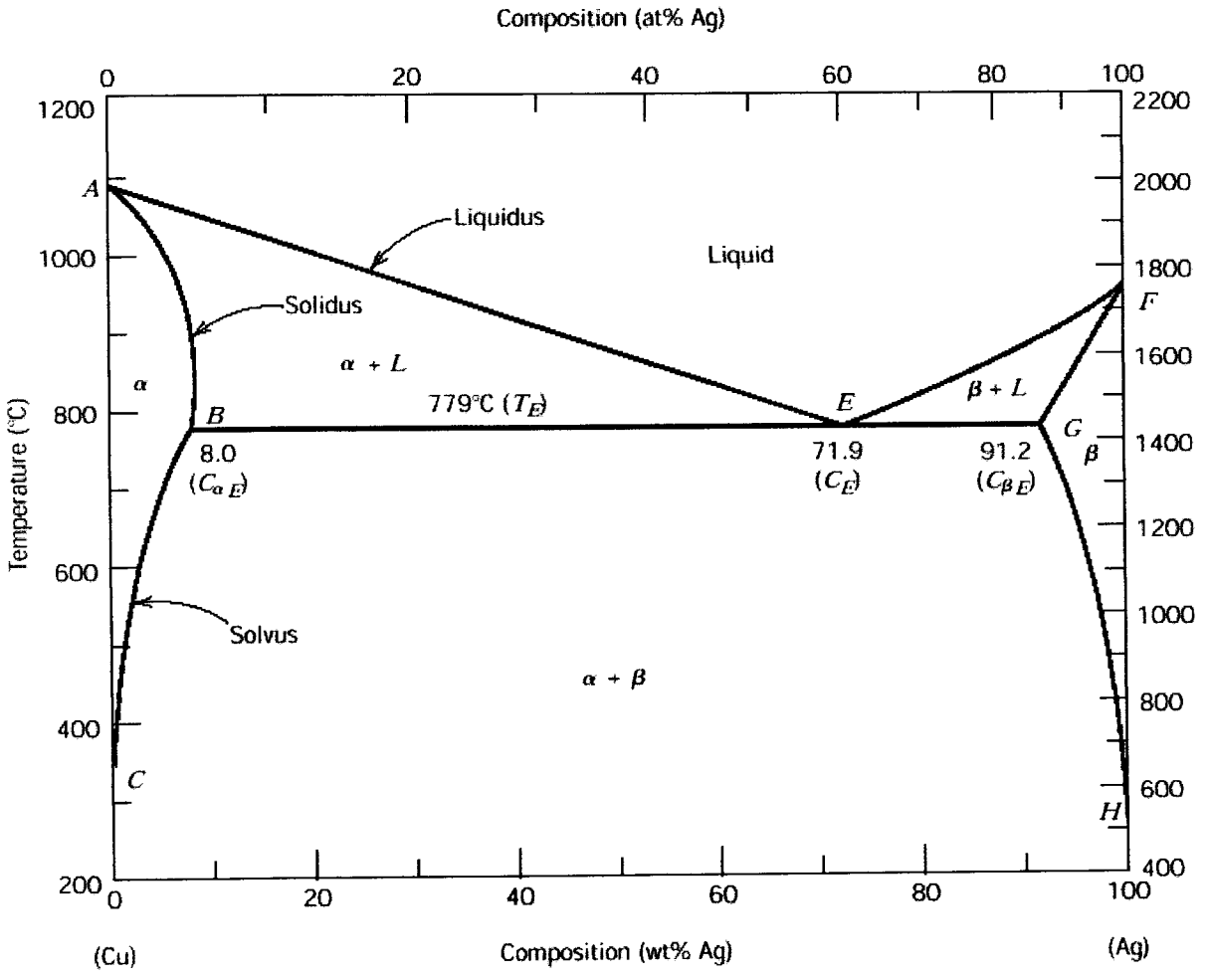

Figure Q4: Cu-Ag phase diagram.

Appendix IV

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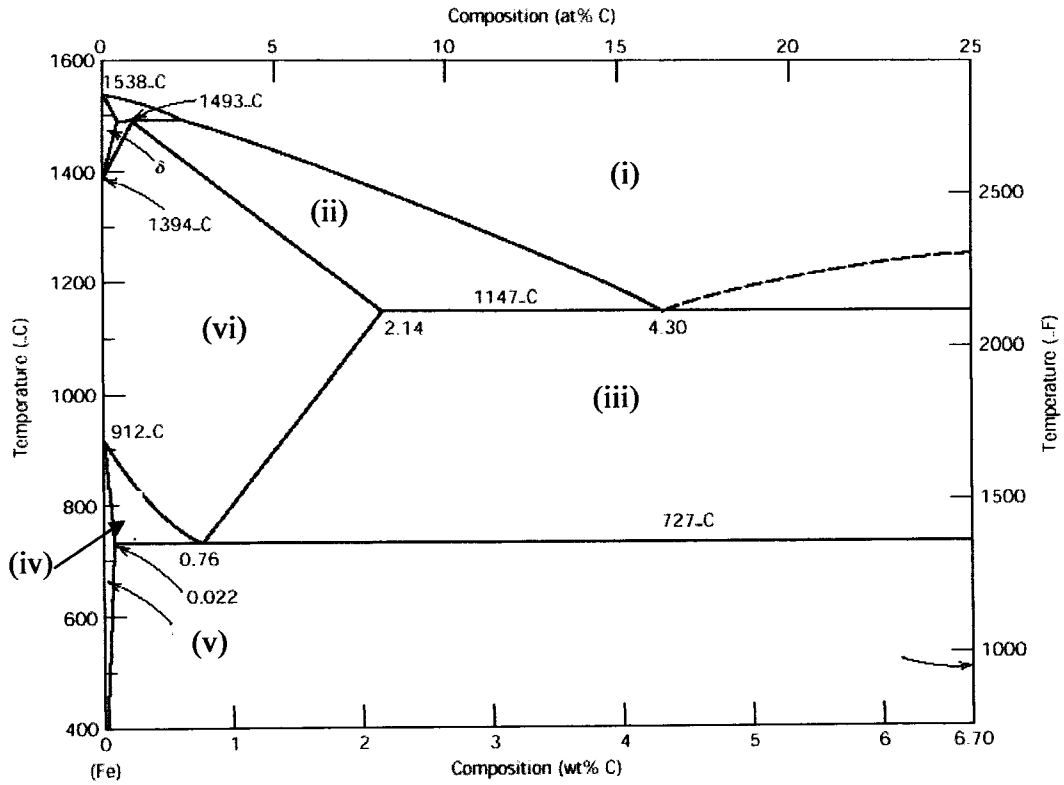

Figure Q5 (a): Fe-Fe_3C phase diagram

Appendix V

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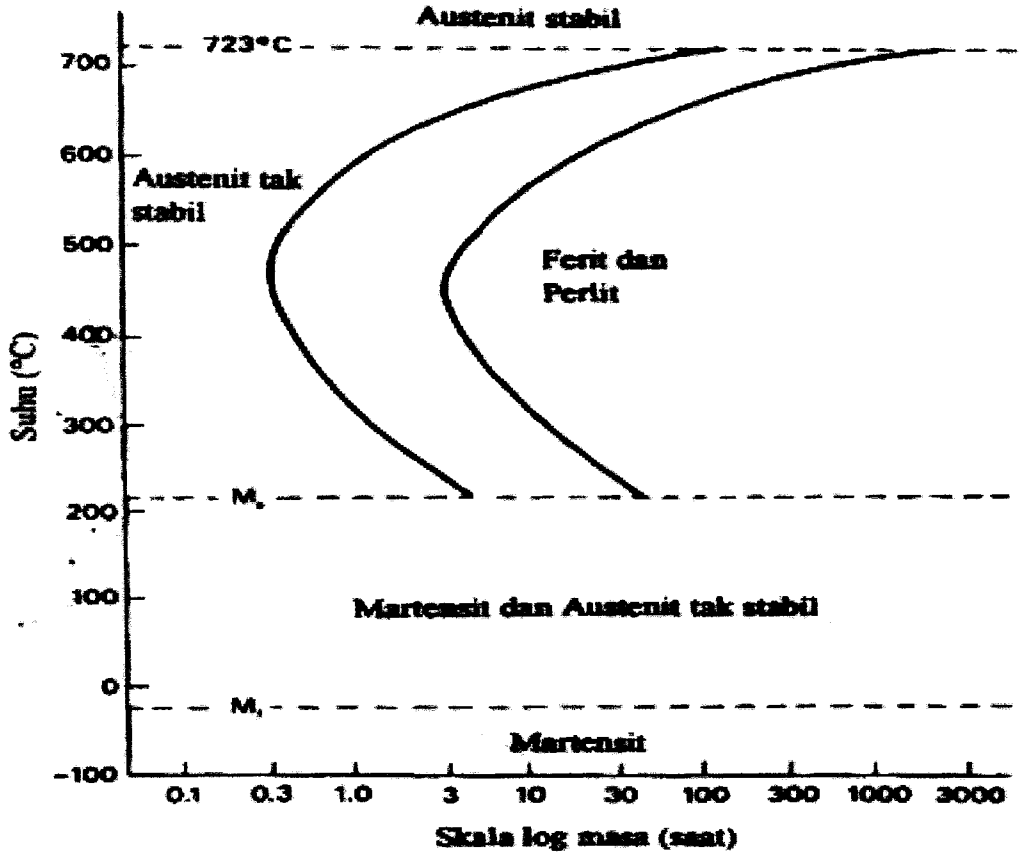

Figure Q5 (b): TTT diagram.