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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE	:	FTD 12102
SUBJECT TITLE	:	METALLURGY
LEVEL	:	DIPLOMA
TIME / DURATION	:	12.30pm – 2.30pm (2 HOURS)
DATE	:	05 MAY 2011

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This question paper consists of FIVE (5) questions. Answer FOUR (4) questions only.
6. Answer all questions in English.

THERE ARE 3 PAGES OF QUESTIONS AND 2 PAGES OF APPENDIX, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR (4) questions only.

Question 1

(a) In iron ore processing, there are several processes involved. Explain the process to produce iron ore.

(15 marks)

(b) In the microscopic examination procedure, the surface of the sample must be smooth and flat. List down the process involved in order to achieve the surface condition of the sampe as above.

(6 Marks)

(c) Show for the body-centered cubic (BCC) crystal structure that the unit length a and the atomic radius R are related through $a = 4R/\sqrt{3}$.

(4 marks)

Question 2

(a) Why Manganese is considered as one of the important elements in carbon steel?

(4 marks)

(b) Describe the advantages of nodular and malleable cast iron compared to gray cast iron in industry. Sketch the microstructure of nodular cast iron.

(6 marks)

(c) Heat treatment involves the use of heating and cooling of metals to alter the physical and mechanical properties without changing the product shape. Annealing is the one of the heat treatment process. Explain the annealing process.

(15 marks)

Question 3

(a) For a bronze alloy, the stress at which plastic deformation begins is 267 MPa and the modulus of elasticity is 115 GPa. What is the maximum load (in N) that may be applied to a specimen having a cross-sectional area of 200 mm^2 without plastic deformation?

(5 marks)

(b) Define the meaning of quenching and list down each type of quenching starting from Phase 1 to Phase 2. Then, briefly describe the process involved in Phase 1.

(15 marks)

(c) Give **ONE (1)** example of etchant type and its uses.

(5 marks)

Question 4

By referring to the Iron – Carbon diagram in Figure 1, answer the following questions

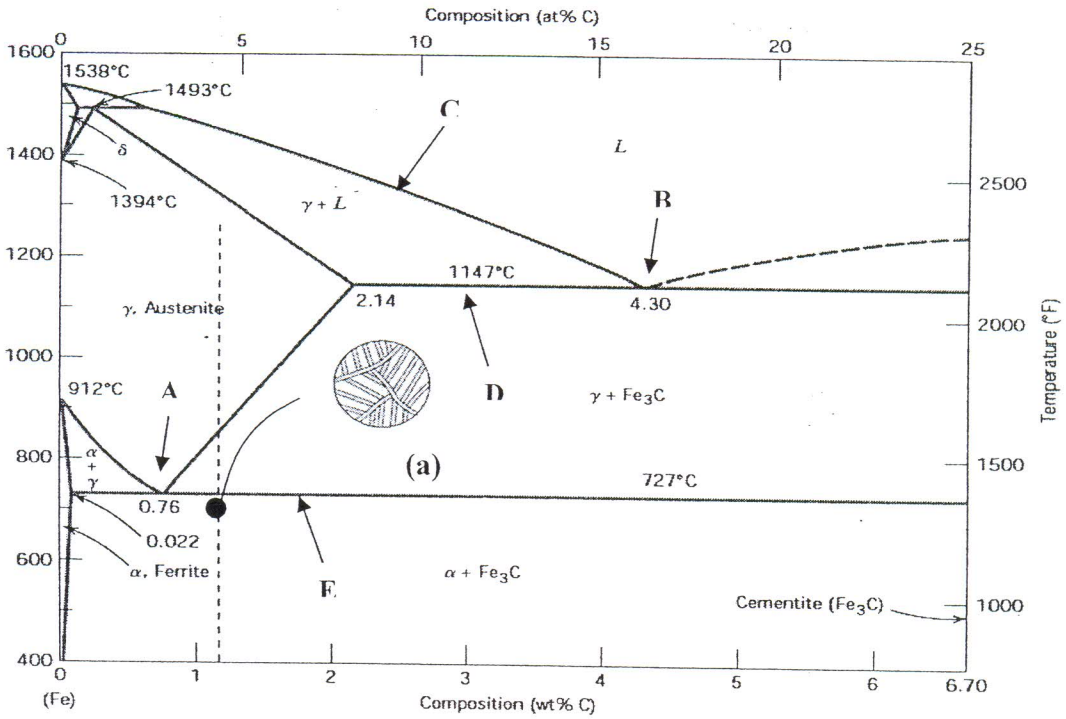

Figure 1: Iron-Carbon diagram of Fe-C

(a) Name the points labeled A and B and line labeled C, D and E.

(10 marks)

(b) Describe liquidus and solidus line.

(5 marks)

(c) Calculate the percentage of Austenite and Ferrite for microstructure (a)

(10 marks)

Question 5

(a) Calculate the Vickers Hardness Number (VHN) for metal if the indentation cause by 60 kg is 2.5 mm for d1.

(4 marks)

(b) List **FOUR (4)** factors that influencing corrosion.

(8marks)

(c) Describe the annealing process.

(13 marks)

END OF QUESTION

Key

29 ← Atomic number
Cu ← Symbol
63.54 ← Atomic weight

IA							VIII					IIIA	IVA	VA	VIA	VIIA	0
1 H 1.0080	IIA									IB	IIB						2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.183
11 Na 22.990	12 Mg 24.312	IIIB	IVB	VB	VIB	VIIB				IB	IIB	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.91	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.34	Rare earth series	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.98	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	Acti-nide series															

Rare earth series	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
Actinide series	89 Ac (227)	90 Th 232.04	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (254)	103 Lw (257)

$$APF = (n)(\frac{4\pi r^3}{3})(\frac{1}{a^3})$$

$$\rho = \frac{nA}{V_c N_A}$$

$$N = \frac{N_A \rho}{A}$$

$$N_v = N \exp(\frac{-Q}{kT})$$

$$a_{fcc} = \frac{4r}{\sqrt{2}}$$

$$a_{bcc} = \frac{4r}{\sqrt{3}}$$

$$a_{sc} = 2r$$

$$D = D_o \exp(\frac{-Q_d}{RT})$$

$$m_\alpha phase = \frac{m_\beta - m_x}{m_\beta - m_\alpha} x Total\ Mass$$

$$m_\beta phase = \frac{m_x - m_\alpha}{m_\beta - m_\alpha} x Total\ Mass$$

$$m_L phase\% = \frac{m_s\% - m_x\%}{m_s\% - m_{L\%}} x100$$

$$m_s phase\% = \frac{m_x\% - m_L\%}{m_s\% - m_{L\%}} x100$$

$$\rho_\alpha = \frac{100}{\frac{C_{A(\alpha)}}{\rho_A} + \frac{C_{B(\alpha)}}{\rho_B}}$$

$$\rho_\beta = \frac{100}{\frac{C_{A(\beta)}}{\rho_A} + \frac{C_{B(\beta)}}{\rho_B}}$$

$$V_\alpha = \frac{\frac{m_\alpha}{\rho_\alpha}}{\frac{m_\alpha}{\rho_\alpha} + \frac{m_\beta}{\rho_\beta}}$$

$$V_\beta = \frac{\frac{m_\beta}{\rho_\beta}}{\frac{m_\alpha}{\rho_\alpha} + \frac{m_\beta}{\rho_\beta}}$$

$$\sigma = \frac{F}{A_o}$$

$$\varepsilon = \frac{\Delta l}{l_o}$$

$$E = \frac{\sigma}{\varepsilon}$$

$$\%elongation = \frac{\Delta l}{l_o} x100\%$$

$$\%\ area\ reduction = \frac{\Delta A}{A_o} x100\%$$

$$BHN = \frac{F}{\frac{\pi D}{2}(D - \sqrt{D^2 - d^2})}$$

$$VHN = \frac{1.85F}{d^2}$$

Metal

Nonmetal

Intermediate

Key

29 ← Atomic number
Cu ← Symbol
63.54 ← Atomic weight

IA												IIIA	IVA	VA	VIA	VIIA	0
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