UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE NAME	:	MATERIALS TECHNOLOGY
COURSE CODE	:	DAM22403 / DDA2043
PROGRAMME	:	2 DAI / 2 DDT
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	2 ½ HOURS
INSTRUCTIONS	:	ANSWER ALL **FOUR (4)** QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

Q1 (a) Materials can be divided into FIVE (5) categories. Each categories has their advantages and disadvantages. From the given statement, answer the following questions:-

(i) List FIVE (5) categories of materials

(5 marks)

(ii) List ONE (1) advantage and ONE (1) disadvantage for TWO (2) types of materials categories.

(4 marks)

(b) Give definition for the following terms:-
(i) Schottky imperfection
(ii) Frenkel imperfection
(iii) Mixed dislocation
(iv) Edge dislocation

(4 marks)

(c) Figure **Q1 (c)** shows the stress strain graph of Polypropylene. By plotting the stress-strain graph, determine the Polypropylene yield strength and tensile strength. (Assume offset line =0.002)

(4 marks)

(d) One rod of aluminium Al 2024-T4 sample will be tested under ASTM B211 to determine tensile properties. The sample have 20mm diameter with 1500mm length and 1480mm gage length. During testing, sample is fractured at 150 KN and the sample diameter is reduced to 10 mm and gage length is elongated to 1500mm. From the given situation, calculate following value:

(i) Engineering stress
(ii) Engineering strain
(iii) True stress
(iv) True strain

(8 marks)

Q2 (a) List FOUR (4) types of heat treatment and describe the purpose of each types.

(8 marks)

(b) List and explain THREE (3)design stages in design process

(6 marks)

(c) By using phase diagram of Pb-Sn (Refer Figure **Q2 (c)**), plot the graph and make a phase analysis for composition of 30% Sn at 183°C + ΔT and 30% Sn at 183°C - ΔT by find:

(i) Each phase composition for 30% Sn at 183°C + ΔT and 30% Sn at 183°C -ΔT.

(5 marks)

(ii)   Find amount of weight proportion for each fraction for 30% Sn at 183°C + ΔT and 30% Sn at 183°C - ΔT.

(6 marks)

Q3   (a)   List FIVE (5) types of mechanical properties testing

(5 marks)

(b)   State FIVE (5) factors which are involved in materials selection

(5 marks)

(c)   Explain THREE (3) methods of materials selection.

(9 marks)

(d)   The support cable rod for a new crane system for a light weight used is required to be designed to withstand a maximum load of 440KN. With 4 supports cables to bear the load equilibriumly. Plain carbon steels from 1045 series were selected. The minimum yield strength and tensile strength of this alloy are 620 MPa and 1130 MPa respectively. Assume safety factor, N = 5

Calculate the suitable size of cable rod diameter.

(6 marks)

Q4   (a) Give FIVE (5) types of corrosion.

(5 marks)

(b) Give FOUR (4) examples of corrosion protection method to avoid corrosion.

(4 marks)

(c) Differentiate between non ferrous metal and ferrous metal.

(2 marks)

(d) Give THREE (3) examples of the following:-
(i)   Non ferrous metal.
(ii)   Ferrous metal.

(6 marks)

(e) Sketch and describe the cathodic corrosion protection method.

(8 marks)

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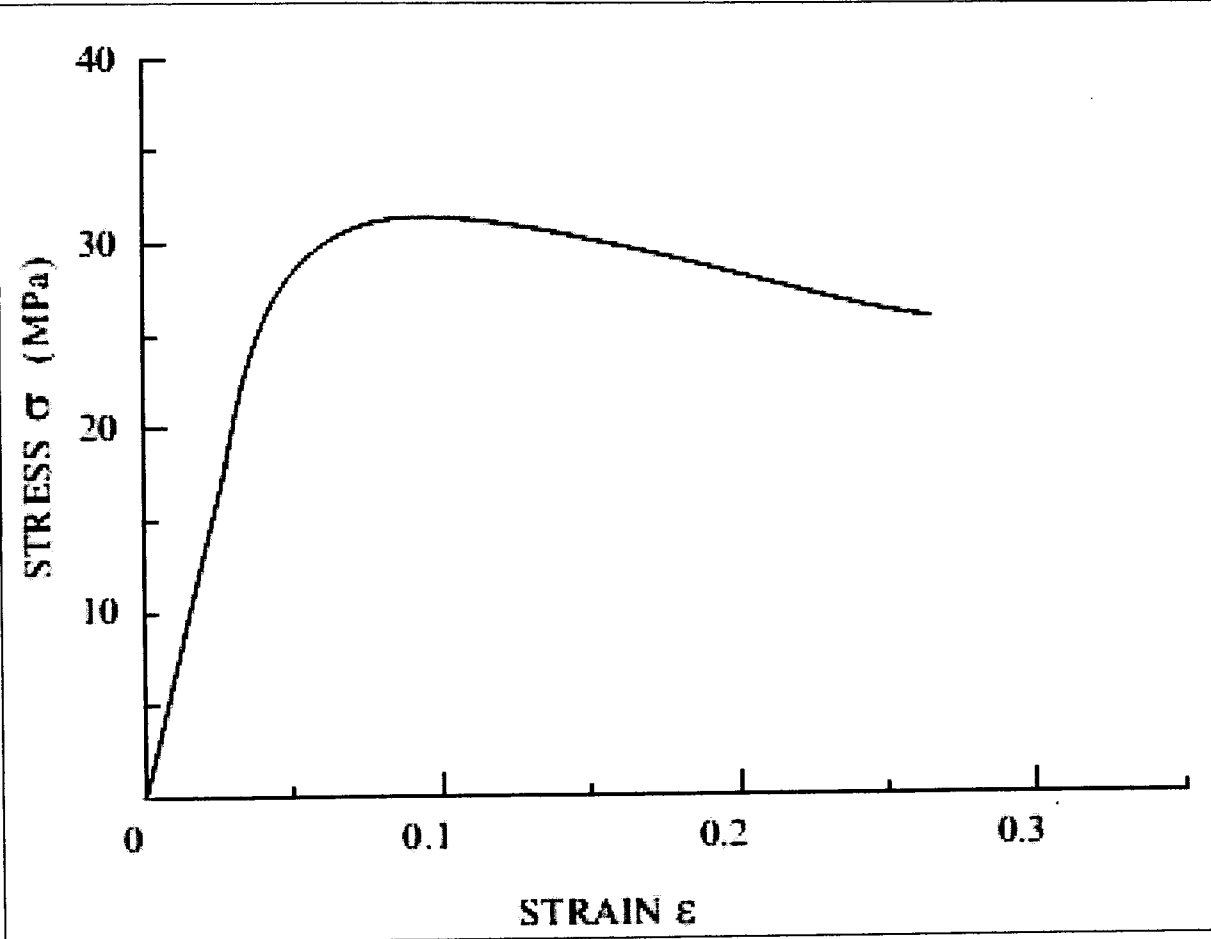SUBJECT   : MATERIALS TECHNOLOGY   SUBJECT CODE : DDA 2043

Figure Q1 (c)

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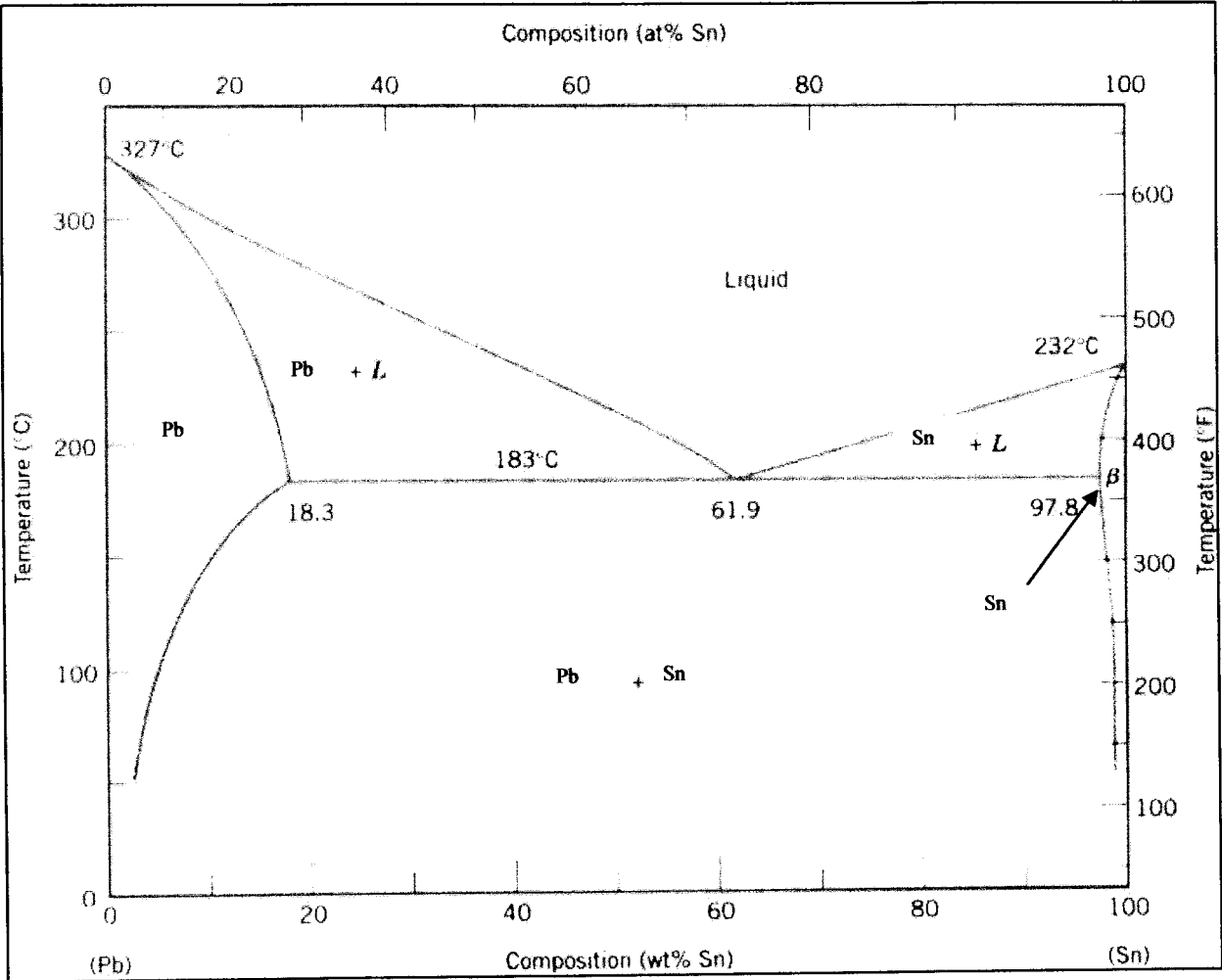SUBJECT   : MATERIALS TECHNOLOGY   SUBJECT CODE : DDA 2043

Figure Q2 (c)