UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	MATERIALS SCIENCE AND TECHNOLOGY
COURSE CODE	:	BNT 10202
PROGRAMME	:	BNT
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWERS ALL **FOUR (4)** QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1   (a)   Name **FOUR (4)** types of basic materials in engineering materials classification.

(2 marks)

(b)   Differentiate in between material science and materials engineering.

(5 marks)

(c)   Differentiate the relationship between the atomic radius (r) and the lattice parameter (a), in;
(i)   simple cubic (SC),

(4 marks)

(ii)   body center cubic (BCC), and

(4 marks)

(iii)   face centered cubic (FCC)

(4 marks)

structures when only one atom is located at each lattice point.

(d)   By comparing direction indices of the body centre cubic (BCC) (110) and (101), identify the most dense plane.

(6 marks)

Q2   (a)   Determine and explain **THREE (3)** systems in Phase Diagram.

(6 marks)

(b)   Identify **TWO (2)** suitable mechanical tests that need to be done to determine the properties and cability of Metal Z to withstand any applied load and to deform plastically by absorbing energy.

(6 marks)

(c)   A 3780 N force is applied to a 0.375 cm diameter nickel wire having a yield strength of 310 MPa and a tensile strength of 379 MPa. Determine whether the wire will plastically deform.

(5 marks)

(d)   Explain **FOUR (4)** most effective methods which can improve the fatigue performance in any design work.

(8 marks)

TERBUKA

CONFIDENTIAL

Q3   (a)   By referring to **Figure Q3(a),** calculate the degree of freedom in a Cu- 40% Ni alloy at the following temperatures;

(i)   1300 °C,
(ii)   1250 °C, and
(iii)   1200 °C.

(10 marks)

(b)   Based on **Figure Q3(b)** for a Pb-30% Sn, determine the phases present, their amounts and the compositions at the following temperatures:

(i)   300 °C
(ii)   200 °C
(iii)   184 °C
(iv)   182 °C
(v)   0 °C

(15 marks)

Q4   (a)   There are two types of polymerization processes known as Addition Polymerization and Condensation Polymerization. Differentiate between these processes.

(8 marks)

(b)   A unidirectional carbon-fiber-epoxy-resin composite contains 68 percent by volume of carbon fiber and 32 percent epoxy resin. The density of the carbon fiber is 1.79 g/cm^3 and that of the epoxy resin is 1.20 g/cm^3.

(i)   Calculate the weight percentages of carbon fibers and epoxy resin in the Composite.

(8 marks)

(ii)   Calculate the average density of the composite

(4 marks)

(c)   Justify the importance usage of composites in aircraft in the context of material science.
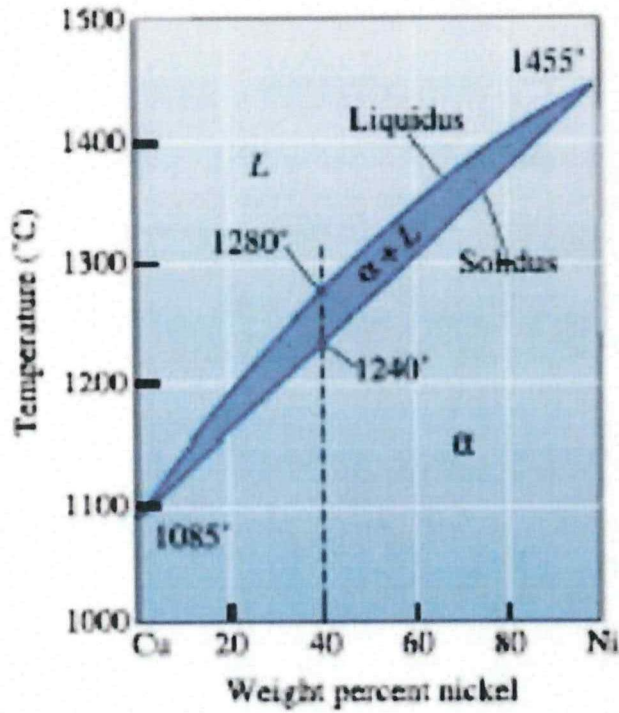
(5 marks)

-    **END OF QUESTIONS** -

TERBUKA

CONFIDENTIAL

Figure Q3(a):The Equilibrium Phase Diagram for the Cu-Ni Systems

FINAL EXAMINATION

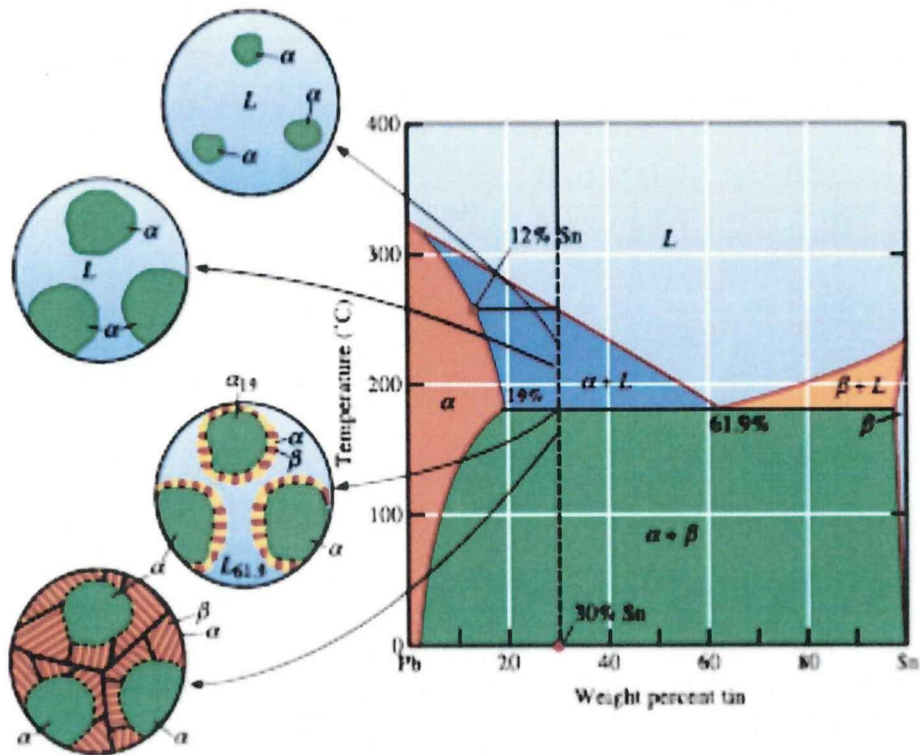|		
SEMESTER / SESSION	: SEM I / 2019/2020	PROGRAMME : BNT
COURSE	: MATERIAL SCIENCE AND TECHNOLOGY	COURSE CODE : BNT 10202

Figure Q3(b): The Solidification and Microstructure of a Hypoeutectic alloy (Pb-30% Sn)