Ministry of Higher Education & Scientific Research

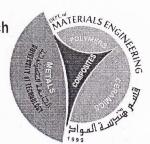
University of Technology

**Department of Materials Engineering** 

Class: 2nd

Date: 15 - 6-2015

Subject: Metals Engineering



وزارة التعليم العالي والبحث العلمي الجامعة التكنولوجية قسم هندسة المواد

Allowed time: 3 hour

Examiner: Dr. Emad AL-Hassani

Signature:

### Note: Attempt Five Questions

Q1: Use this data for	a series of A	A-B all	oys to	produce	the ph	ase dia	gram
		Marie N. Marie					

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Temperature °C (T1)	750	740	700	625	500	300	250
Temperature °C (T2)	750	700	525	400	325	260	250
Concentration % B	0	10	30	50	75	90	100

For alloy which contain 40% B and weight of the alloy 200 grams answer the following questions

- 1. Start and completely solidification
- 2. Weight and concentration of phases at 400 °C

## Q2: The diffusion coefficients for two elements are given in table below

$D *10^{-3} (m^2/s)$	60	80	130	170	200	
T (K)	527	627	727	827	927	

- A. Determine the values of D<sub>0</sub> and the activation energy
- B. What is the magnitude of D at 227 °C
- <u>Q3:</u> A carburizing is carried out on a 0.1%C steel by introducing 1.0%C at the surface at 977°C; calculate the carbon content at 0.01 cm, and 0.05cm, from the surface after 1hour? If you know that Do= 0.23Cm<sup>2</sup>/sec, Q= 37500 cal/mol, R= 2cal/mol, and erf (u) =u.

#### *Q4*:

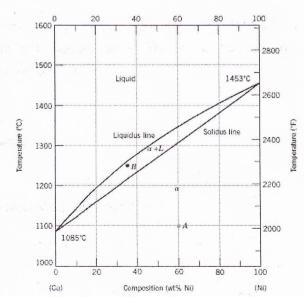
- A. Explain how can be produce malleable cast iron?
- B. List the type of cast iron according to the microstructure.

#### *Q5*:

- A. What are the properties of eutectic structure?
- B. What are the important points in iron -carbon equilibrium diagram?

**Q6:** A copper–nickel alloy of composition 70 wt% Ni–30 wt% Cu is slowly heated from a temperature of (1300 °C).

- **A.** At what temperature does the first liquid phase form?
- **B.** What is the composition of this liquid phase?
- **C.** At what temperature does complete melting of the alloy occur?
- **D.** What is the composition of the last solid remaining prior to complete melting?



# Good luck