# KIBABII UNIVERSITY
# (KIBU)

## UNIVERSITY EXAMINATIONS
## 2019/2020 ACADEMIC YEAR

## THIRD YEAR SECOND SEMESTER
## SPECIAL/SUPPLIMENTARY EXAMINATIONS
## FOR THE DEGREE
## OF
## BACHELOR OF SCIENCE IN PHYSICS

**COURSE CODE:** SPH 324

**COURSE TITLE:** STRUCTURAL CHANGES

**DATE:** 8/2/21 **TIME:** 8-10 Am

**INSTRUCTIONS TO CANDIDATES**

TIME: 2 Hours

**Answer question ONE and any TWO of the remaining.**

**Symbols used bear the usual meaning.**

KIBU observes ZERO tolerance to examination cheating

## Question One (30 marks)

a) State the meaning of the following terms commonly used in solid phases and Phase diagrams (i) System (ii) Components (iii) Phase (iv) Phase transformation (4 marks)

b) State four forms in which an alloy can exist in solid state (4 marks)

c) Describe the difference between cold and Hot working as relates to material fabrication (2 marks)

d) Describe the different types of solutions in solid state (i) Simple Eutectic type (ii) Solid solution type (iii) Combination type (iv) Inter-metallic Compounds (4 marks)

e) State three factors that govern the structure of an intermediate phase (3 marks)

f) Describe the Hume-Rothery's rules of formation of a solid solution (3 marks)

g) Describe the Gibbs phase rule stating the components involved (3 marks)

h) Outline briefly the basic principles of a Resin Transfer Moulding (RTM) in the context of design and production of Fibre reinforced plastic artifacts (5 marks)

i) Briefly explain the meaning of surface integrity in relation to manufactured surfaces and their properties and applications (2 marks)

## Question Two (20 marks)

a) Discuss the Czochralski silicon growth process with an aid of a schematic diagram describing the steps involved to get the final pure Silicon (12 marks)

b) Discuss the Gas Phase synthesis process of fabricating Silicon carbide on a substrate showing essential reaction steps (8 marks)

## Question Three (20 marks)

a) Discuss the Recovery, Recrystallization and Grain growth phenomenon in a deformed material (9 marks)

b) Discuss the formation of a solid solution specifying the two main types (6 marks)

c) Describe any five engineering alloys commonly used (5 marks)

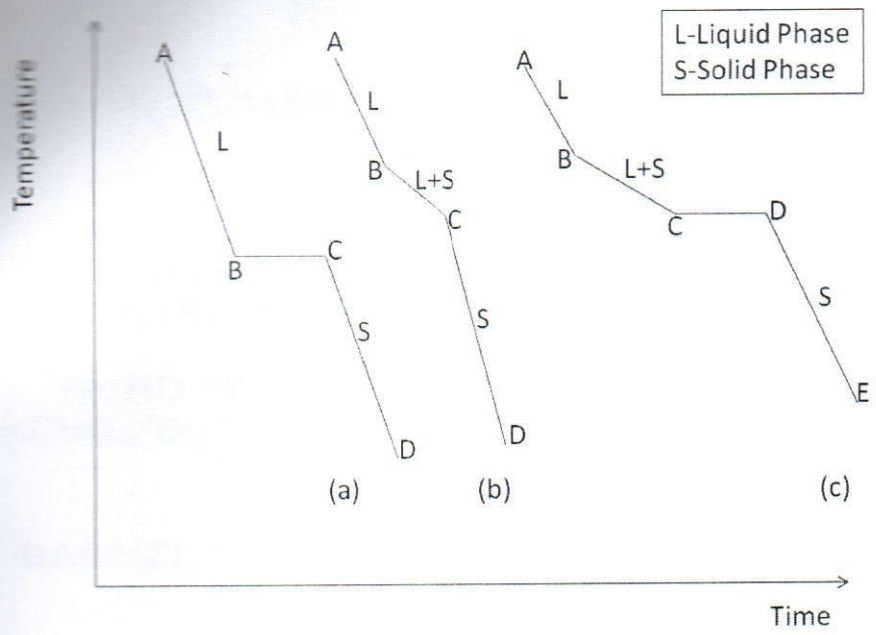
## Question Four (20 marks)

a) In conventional metal cutting process tool wear is inevitable, discuss the most significant factors causing tool wear and explain why tool wear is difficult to predict (8 marks)

b) Describe four different methods that can be used for on-line monitoring of tool ware, indicating the possible problems associated with each method and justify the method that you consider to show most promise (12 marks)

## Question Five (20 marks)

a) Discuss the cooling curves shown in the diagram below indicating the nature of material and phase transitions involved in each segment (12 marks)




b) Discuss the effect of slow and rapid cooling curves with illustrations for a pure metal with reference to the concept of recalescence. (8 marks)