



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
Diploma in Mechanical Engineering (Production Option, Y2S1)
EPR 2202 : Material Processes I (Paper 2)
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Sep 2018

Instruction to Candidates:

You should have the following for this examination

- *Examination Pass & Student ID Card*
- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.

Maximum marks for each part of a question are as shown.

Do not write on the question paper.

Question ONE

- a) **(6 marks)**
- Clearly define the term polymeric and state the TWO main types.
 - State four desirable characteristics of polymers and one method of improving their strength.
- b) **(6 marks)**
- State the TWO main conditions that must be met to give an efficient bearing combination.
 - Differentiate between “Tin Base” and Lead Base” bearing metals.
 - Differentiate between Bronzes and Brasses.
- c) Clearly describe corrosion and state TWO short term and two long term methods of corrosion prevention. **(4 marks)**

- d) (4 marks)
- i. Describe the purpose of surface hardening heat treatment and state two advantages of such a process on steel.
 - ii. Describe heat resistant steels and state two effects caused by alloying.
- e) (4 marks)
- i. Define the term “phase” of a solid selection.
 - ii. Differentiate between the Eutectic and Eutectoid solid solution structures of an equilibrium diagram.

Question TWO

- a) (10 marks)
- i. Define the term plastics.
 - ii. Differentiate between the two types of plastics and list any TWO common examples of each.
 - iii. State TWO common properties and two practical applications for most plastics.
 - iv. State FOUR sources from which plastics are made from.
- b) (10 marks)
- i. Describe any TWO ways how bearings may be manufactured and state any FOUR bearing materials.
 - ii. State any THREE desirable properties that all bearing material must always possess.
 - iii. Differentiate between Nylon and Graphite as bearing materials.

Question THREE

- a) (6 marks)
- i. Define corrosion and state any TWO factors that govern the rate corrosion.
 - ii. Describe the TWO mechanism of corrosion and state two media that may accelerated corrosion.
- b) With the aid of labelled neat sketches describe the corrosion protection of steels by “Zinc” and “Tin”. (7 marks)
- c) (6 marks)
- i. State TWO reasons why oil or grease is not desirable for long term protection.
 - ii. List any two methods of permanent protection of corrosion and two methods of suitable preparation.

Question FOUR

- a) **(12 marks)**
- i. Describe what is involved in surface hardening and the effect of quenching carbon steels.
 - ii. Clearly describe the process case of hardening and purpose of such a treatment.
 - iii. Differentiate between “Flame Hardening” and “Nitriding” surface hardening processes.
- b) **(8 marks)**
- i. Discuss three main reasons why plain carbon steels are limited to most heat resisting operations.
 - ii. State any TWO major important requirements for most heat resisting steels and state any SIX important industrial applications of such steels.

Question FIVE

- a) **(10 marks)**
- i. Explain clearly the term Equilibrium Diagram in relation to metal solidification.
 - ii. Describe solid solution explain with illustration the two forms of solid solution when two metals are completely soluble in each other.
- b) **(10 marks)**
- i. Describe using a labelled sketch of a Lead-Tin partial solubility equilibrium diagram, the various phases present to form such an alloy.
 - ii. Discuss Allotropy and explain one example of such an element.