



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

ECL2303: PHYSIOTHERAPY EQUIPMENT

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 9 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other **TWO** questions.

Do not write on the question paper.

Question ONE

- (a) i) Describe the **two** factors that contribute to attenuation in ultrasound machine.
- ii) The skin impedance at 50Hz is given as 3.2Ω . Calculate the impedance at 4000Hz. (10 marks)
- (b) Describe **five** causes of burns resulting from use of electrotherapy (10 marks)
- (c) With aid of a well-labelled diagram, describe a microwave therapy assembly (10 marks)

Question TWO

- (a) i) Draw a labelled diagram of a radiation balance used to check the power output of an ultrasound set.
- ii) Define the term artefact as used in ultrasound stating any four examples. (10 marks)
- (b) i) State any **three** factors which affects the heat generated in the tissue when using short wave diathermy.
- ii) Explain the need for the following microwave therapy test

- Stray radiation
- Voltage standing wave ratio
- Control interlock check

iii) State any **two** advantages and **two** disadvantages of interferential therapy over shortwave therapy (10 marks)

Question THREE

- (a) i) Describe **three** uses of therapeutic Infra-red radiation.
- ii) Explain any **two** dangers of infra-red radiation. (10 marks)
- (b) Describe the construction of a short wave machine using a block diagram. (10 marks)

Question FOUR

- (a) i) Explain the method of generation of ultrasonic energy.
- ii) With the aid of a general block diagram, explain the operation of ultrasonic therapy machine.
- iii) Differentiate the basis under which ultrasonic therapy and diagnostic ultrasound machines operate.
- iv) Ultrasonic therapy machines are frequency operated together with a muscle stimulator. Describe the connection mode for such an instance. (10 marks)
- (b) i) Name the **TWO** components produced by ultrasonic energy that have therapeutic attributes on body tissue.
- ii) With the aid of a block diagram, explain the operation of an ultrasonic therapy machine that incorporate detection of sound acoustic coupling.
- iii) Explain why acoustic coupling should be sound during therapy. (10 marks)

Question FIVE

- (a) i) A nerve cell exhibits monostable electric behaviour. Explain this behaviour.
- ii) Describe the sequence of events that occur from stimulation, contraction and relaxation of a muscle fibre. Use diagrams to illustrate. (10 marks)
- (b) i) Explain the following therapeutic uses of infrared radiation.
- I) Muscle relaxation
 - II) Relief of pain
 - III) Increased blood supply

ii) Compare and contrast between Infrared radiation and high frequency heat treatment. (10 marks)