**SOUTH EASTERN KENYA UNIVERSITY**

**UNIVERSITY EXAMINATIONS 2016/2017**

**FIRST SEMESTER EXAMINATION FOR THE DEGREE OF**

**BACHELOR SCIENCE IN ELECTRONICS**

**ELC 403: ELECTROMAGNETIC COMMUNICATION**

**TH**

**DECEMBER, 2016**

**TIME: 1.30-3.30 P.M**

**INSTRUCTIONS:**

1. Attempt question **ONE** and any other **TWO** questions

2. Question one carries **30 marks** while the rest carry **20 marks each**

**QUESTION ONE (30 MARKS)**

(a) (i) Name the three ways in which radio waves may travel from the transmitting to the

receiving antenna.

(ii) Classify ground waves

(b) (i) Name the parameters that the magnitude of the above classification in

1 (a) (i) depends on

(6 Marks)

(4 Marks)

(4 Marks)

(ii) Calculate the value of frequency at which the electromagnetic wave

must be propagated for the D-region to have an index of refraction of 0.5. (6 Marks)

(c) Distinguish between the following terms as applied to propagation of electromagnetic

waves

(i)

(ii)

Surface and sky waves

Ionosphere and Troposphere

(iii)

D, E, F1 and F2 layers

(4 Marks)

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(d) What do you understand by the following terms as applied to electromagnetic wave

propagation in ionosphere.

(i)

(ii)

Plasma frequency

Skip distance

(iii)

Maximum usable frequency (MUF)

(6 Marks)

**QUESTION TWO(20 MARKS)**

(a) Give a brief account of the effect of ionosphere on sky waves

(b) Show that the ionosphere behaves as a medium of refractive index

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(8 Marks)in

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where symbols have their usual meaning and the

effect of the earth’s magnetic field and collision in the ionosphere may be neglected.

(12 Marks)

**QUESTION THREE(20 MARKS)**

(a) How ionosphere instrumental in achieving long distance radio communication? (6Marks)

(b) For what frequency in general is the ionosphere useful?

(2Marks)

(c) Compute the relative permittivity of D, E and F regions of the ionosphere case of

electromagnetic wave with frequency of 50Mc/s. Given that the density of electrons for

the D, E and F regions are 400, 5× 105 and 2.02× 106 electrons.

**QUESTION FOUR(20 MARKS)**

(a) Briefly account for the parameters on which the skip distance Dskip on.

(b) Obtain an expression for the skip distance, Dskip in terms of critical

frequency of the layer.

(c) Calculate the value of the frequency at which an electromagnetic must

be propagated for the D-region to have an index of refraction of 0.5.

**QUESTION FIVE(20 MARKS)**

(a) Derive expression for

(12Marks)

(5Marks)

(8Marks)

(7Marks)

(i)

(ii)

Phase and group velocities

Refractive index

for an electromagnetic wave propagating in ionosphere.

(10 marks)

(10 Marks)

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