



TECHNICAL UNIVERSITY OF MOMBASA



A Centre of Excellence

Department of Electrical & Electronic Engineering

SECOND YEAR/SECOND SEMESTER TEST 1

BSc. (ELECTRICAL) 4R & 4P

EEE2215 : ELECTROMAGNETICS 1

JUNE 23RD 2011

TIME : 90 MINUTES

ATTEMPT ALL QUESTIONS

1. (a) Why is the basic knowledge of EM principles so important especially as relates to processing speeds of digital electronic devices? (2 marks)
- (b) The current at the output of a digital electronic device is given by

$$i(t, z) = I \cos(\omega t - \beta z)$$

Where βz is the phase shift of the output current compared to the input current. Show that this phase shift is equivalent to a time delay which is given by $\frac{z}{v}$ seconds. (11 marks)

- (c) (i) Contrast between physical and electrical dimensions.
- (ii) A cell phone operates at a frequency of 1GHz. Determine the electrical dimension of a typical connecting lead within the cell phone circuit that will ensure negligible phase shift. (6 marks)
- (d) What is electromagnetic compatibility and why is it becoming an increasing concern in today's high density high-speed electronic systems?

(4 marks)

2. (a) Find (i) Scalar product

(ii) Vector product

(5 marks)

of the vectors $\mathbf{A} = 3i - 2j + 4k$

$$\mathbf{B} = i + 5j - 2k$$

(b) If $\mathbf{A} = 2i + 3j - 5k$; $\mathbf{B} = 3i + j + 2k$ and $\mathbf{C} = i - j + 3k$

Determine (i) The scalar triple product $\mathbf{A} \cdot (\mathbf{B} \times \mathbf{C})$

(ii) The vector triple product $\mathbf{A} \times (\mathbf{B} \times \mathbf{C})$

(iii) Whether the three vectors are co-planar. (11 marks)

3. (a) A surface is defined as $r = 2$, $0 \leq w \leq f/3$, $1 \leq z \leq 4$. Determine the area of the surface. (Sketch the figure). (17 marks)

(b) Determine the volume of a region defined by $1 \leq r \leq 2$, $0 \leq w \leq f/3$, $0 \leq z \leq 4$. (Sketch the figure). (9 marks)