# EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

# END TERM I EXAMS

**DIPLOMA IN AURONAUTICAL ENGINEERING AVIONICS**

**COMMUNICATION AND NAVIGATION SYSTEMS**

**STREAM: Y3 Avionics** **Duration:**

**DAY/DATE:** **TIME:**

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**INSTRUCTION TO CANDIDATES**

*You should have the following for this examination:*

*Answer booklet;*

*Mathematical tables/ Electronic calculator.*

*Answer **ALL QUESTIONS** in this paper*

*All questions carry equal marks.*

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

*Take 1) Impedance of free space £=377Ω*

*2) Free space wave velocity , C=3x10$^8$ m/s*

**This paper consists of Four (4) printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

1 (a) Define each of the following as applied to radar systems

i) Clutter

ii) Angle resolution **(2 Marks)**

(b) Explain the following with respect to radar systems

i) Blind speed

ii) Doppler effect.

iii) With the aid of a labelled diagram, describe the operation of the A-scope diplay. **(14 marks)**

(c) A low –noise radar system operates at 8 GHz with an r.f amplifier whose noise figure is 6dB and bandwidth 400KHz. The antenna diameter is 4 m and it radiates 5w towards a target whose cross-sectional area is $12m^2$. Determine the radar range of the system. **(4 marks)**

2. (a) Define the following with respect to radar system.

i) Maximum unambiguous range

ii) Range resolution **(6 marks)**

(b) A radar system operates at 6 GHz with pulse repetition frequency of 600 pulses per second. Determine the lowest blind speed in Km/hr. **(4 marks)**

(i) With a circuit diagram, explain the operation of "Hard Tube-Modulator in a radar transmitter.

ii) A radar system operates at 2 GHz using an antenna of capture area of $3m^2$ with the target cross-sections are being $18m^2$. If it radiates 40Kw,determine the minimum receivable power over 80km range **(10 marks)**

3. (a) Name the two components of DME system. **(2 marks)**

(b) i) Explain the main purpose of DME system in aircraft navigation

ii) Draw a well lebelled block diagram of total DME system **(8 marks)**

c) With respect to VOR system explain five main errors **(10 marks)**

4. a) State THREE (3) advantages of waveguide over coaxial cable **(6 marks)**

b) Distinguish between " Transverse Electric" and Transverse Magnetic Modes as applied to waveguides. **(4 marks)**

c) A rectangular waveguide of dimensions 3.0cm has a signal of 7.5 GHz propaged through it. For the $TE^{1}$,o, determine the :-

i) Cut-off wavelength

ii) Guide wavelength

iii) Group velocity

iv) Wave guide impenance **(10 marks)**

5. a) State the operating frequencies of the following ILS components

i) Localizer

ii) Glide slope

iii) Marker Beacons **(8 marks)**

b) List any two causes of signal attenuation in waveguide **(4 marks)**

c) A parallel –plane waveguide, operating at 8GHz, has a plane separation of 4cm when carrying the dominant mode. Determine the:

i) Cut-off wavelength

ii) Group velocity

iii) Phase velocity **( 8 marks)**

******End******