INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2013
Programme	:	Diploma in Electrical and Electronic Engineering Programme
Course	:	**EEE2109 : Elecronic Communication Systems**
Date of Examination	:	8 March 2013
Time	:	11a.m. – 1p.m. Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted : Nil

Materials provided : Nil

Examiner(s)	:	**Koay Ting Hoo**
Moderator	:	**Alan Wong**

This paper consists of 4 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE2109 ELECTRONIC COMMUNICATIONS SYSTEMS
FINAL EXAMINATION: JAN 2013 SESSION

This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks. Boltzmann constant = 1.38×10^{-23} J/K)

Question 1

(1) (a) An isotropic antenna broadcasts a free to air TV program at 600MHz using PAL format. A car has a whip antenna to receive the signal. The car receiver has a noise figure of 100. The isotropic antenna has radiation resistance of 50 ohms and antenna resistance of 2.5Ω. The broadcasting power is 1kW. The noise temperature is 17°C. Assuming receiver capture area =0.02936 m^2.

(i) Calculate the length of Marconi antenna. (2 marks)
(ii) Calculate the effective radiated power of broadcast antenna in dBm. (3 marks)
(iii) Sketch the voltage and current relationship in the Marconi antenna, label the antenna current, antenna voltage, ground, antenna image and source of signal. (10 marks)
(iv) Calculate the S/N in dB and evaluate the quality of image and sound in the car at 500 meter away from the broadcast station in a free space.
Given bandwidth of TV signal = 8 MHz.
(10 marks)

Question 2

(2) (a) Sketch a microwave oven with a magnetron source, label the following in your sketch and explain its purpose :
(i) Fan Stirrer
(ii) Waveguide
(iii) Cathode Cylinder
(iv) Anode Cylinder
(10 marks)

(b) The microwave oven is using 2.45GHz to heat the food and waveguide can be impedance matched and tuned using adjustable means.

(i) Calculate the characteristic wave impedance for each possible propagation mode for a rectangular waveguide measures 7cm x 14cm.
(15 marks)

Question 3

(3) (a) By referring to the sketch of computer network, list FIVE (5) types of network topology and explain the advantage for each.

(10 marks)

(b) MTI radar operates at 10GHz with peak power at 1kW, with Pulse Repetition Frequency (PRF) of 1250pps. The duty cycle of the radar is 0.01. An enemy plane (target) is travelling at 300km/h at 60° and 50km from the MTI radar at time of scan.

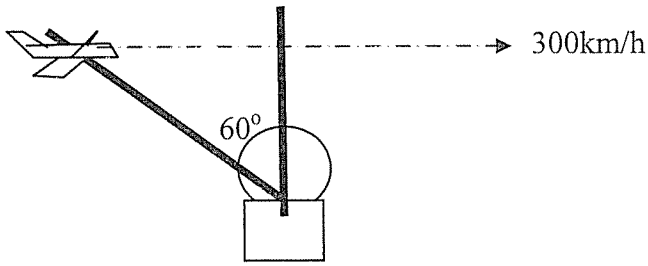

Fig 3.0 – MTI radar

Calculate:

(i) Minimum range in yards. (2 marks)
(ii) The average power for this radar and its target time (4 marks)
(iii) Doppler frequency (4 marks)
(iv) Lowest two blind speeds of the radar (2 marks)
(v) Subtractor output from phase detector in "A scope" display. (3 marks)

Question 4 :

(4) (a) Sketch a typical microwave varactor construction with proper label of following items.

(i) Gold-plated molybdenum stud
(ii) Ceramic tube
(iii) Gold-plated wire
(iv) Diffused mesa GaAs

(5 marks)

(b) A 10mW fiber optical system is using graded-index 85/125μm MMF for 1550 nm light transmission. The refractive index of core is 1.48 and cladding is 1.46. The fiber cable is 20km and cable loss is 0.4dB/km. The APD photodiode used has R=70A/W and dark current is 5nA. The laser and APD diode has 100μm diameter and NA=0.3.

(i) Calculate the minimum signal power for S/N > 40. (4 marks)
(ii) Calculate the critical angle of the fiber and cone of acceptance. (3 marks)
(iii) Determine Power budget available in dB to have S/N>40. (2 marks)
(iv) Describe three possible losses when light is coupled to fiber. (3 marks)
(v) Calculate the total losses in the above fiber optical system. (6 marks)
(vi) Sketch the fiber propagation mode of this fiber. (2 marks)

Question 5

(a) There are 10 analog inputs to be converted into digital data and multiplexed into a single frame PCM before amplitude modulated and transmitted. Each analog input is produced by motor tachometer that registered variation as high as 10,000 revolutions per second. The tachometer has output from -5V to 5V with required resolution of 0.01V. Each PCM frame is identified by a sync bit. Determine:

(i) Minimum sampling rate for A/D (3 marks)
(ii) Dynamic range of analog signal. (3 marks)
(iii) Quantization Signal to Noise in dB. (3 marks)
(iv) Suitability of 5MHz Cable for signal transmission. (3 marks)
(v) Maximum pulse width. (3 marks)
(vi) Encoded data bit '10111011' into even parity Hamming code. (10 marks)

Question 6

(6) (a) Compare the following communication terms :
(i) DTMF Phone versus Ring Phone
(ii) Cross Talk versus Echo
(ii) VSAM Modulation versus AM
(iii) TDM versus FDM
(iv) Packet switching versus circuit switching

(10 marks)

(b) The horn antenna gain of receiver is 20dB and at 5 meter from isotropic transmitter of 10GHz, 10mW. The horn is connected to the waveguide of 25cm and dimension of guide is 2 cm x 1cm, transmission mode is dominant mode. The noise temperature for the receiver is 17°C and noise figure is 3dB. The bandwidth of information is 20MHz.

(i) Determine the effective capture area of horn antenna. (2 marks)
(ii) Determine the power received at horn antenna. (2 marks)
(iii) Sketch and name three basic types of horn antenna. (6 marks)
(iv) Determine the power attenuation for 1 GHz signal at waveguide. (2 marks)
(v) Evaluate good image transmission in the waveguide. (3 marks)