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INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session : August 2012

Programme : Diploma in Electrical and Electronic Engineering Programme

Course : EEE2109 : Electronic Communications Systems

Date of Examination : 11 December 2012

Time : 2p.m. – 4p.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 5 printed pages, including the cover page.

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DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE2109 ELECTRONIC COMMUNICATIONS SYSTEMS
FINAL EXAMINATION: AUGUST 2012 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 = $1.38 \times 10^{-23} \text{ J/K}$

Question 1

- (1) (a) Name the propagation methods for path A,B,C,D and E and identify physical properties in Figure 1.0 that aids the propagation methods.

(10 marks)

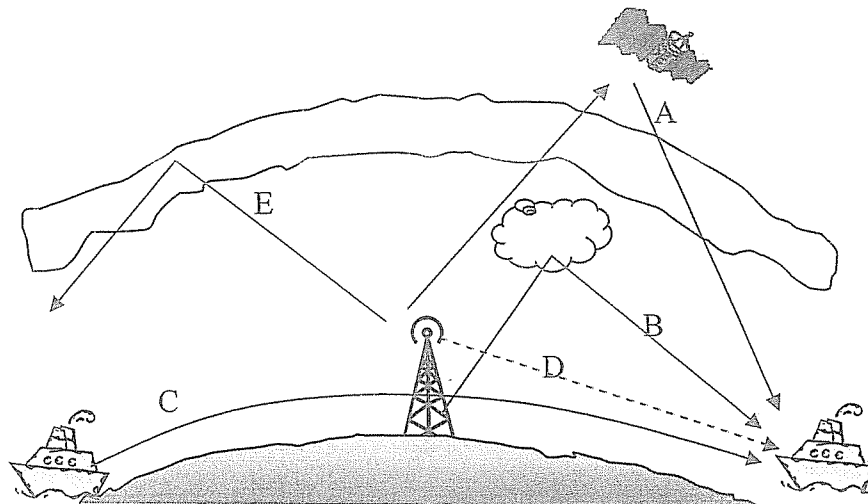


Figure 1.0: Wave Propagation.

- (b) A directional antenna broadcasts a 600 MHz signal. The maximum power density is $10 \mu\text{W/m}^2$ compared with half wave dipole antenna of $2 \mu\text{W/m}^2$. The efficiency of antenna is 85% and loss resistance or antenna resistance of 8Ω .
- Calculate the directive gain in dBi for the directional antenna. (3 marks)
 - Determine power gain and radiation resistance for the directional antenna. (2 marks)
 - Calculate the beam width and the field gain of a 30m parabolic reflector. (2 marks)
 - Sketch a horn feed offset parabolic reflector with proper labels of rays. (5 marks)
 - Determine effective radiated power for (iii) if transmitter has an overall efficiency of 50% and a 1W signal is fed to transmitter. (3 marks)

Question 2

- (2) (a) By referring to sketch of microstrip and stripline construction, discuss **THREE (3)** advantages of using microstrip as compared with stripline. (10 marks)
- (b) A triode amplifier has $g_m=4\text{mA/V}$ and $r_p=8\text{k}\Omega$, the anode series inductance is $1.59\mu\text{H}$ and anode to cathode capacitance of 6.28pF . The anode load is $R_L=40\text{k}\Omega$. The equivalent output circuit at 5kHz is shown in Figure Q2. The voltage gain deteriorates when signal frequency increased from 5kHz to 1GHz .

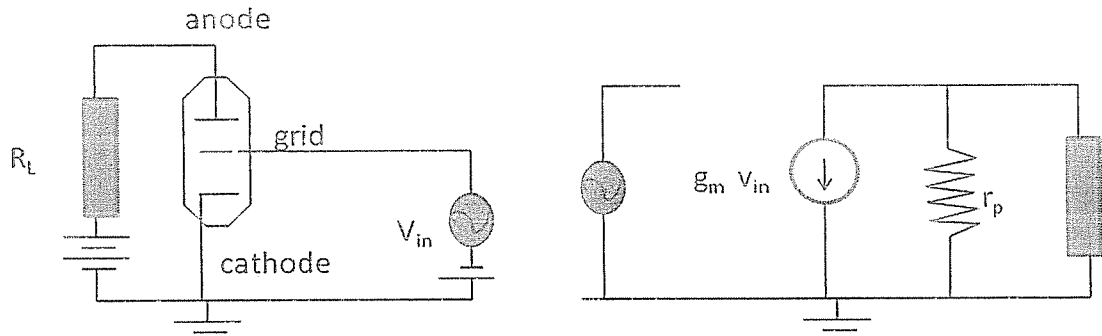


Figure Q2: Triode Amplifier at audio frequency (schematic and ac equivalent)

- (i) Explain two causes of gain deterioration at 1GHz for this circuit. (4 marks)
- (ii) Sketch the equivalent circuit for this triode amplifier at 1GHz , and label the voltage output and associated reactance. (6 marks)
- (iii) Calculate reduction in voltage gain at 1GHz versus at 5kHz . (5 marks)

Question 3

- (3) (a) Explain **FIVE (5)** differences between Baudot code and ASCII code. (10 marks)
- (b) Pulsed radar operates at 10GHz with peak power at 1kW , with Pulse Repetition Frequency (PRF) of 1250pps . The duty cycle of the radar is 0.005 . The first return echo is $400\mu\text{s}$. Calculate:
- Maximum Unambiguous range (MUR) in miles.
 - Minimum range in yards.
 - The target distance and band of operation
 - The Average power for this radar.
 - Number of cycles of sine wave for every transmitted pulse.
 - Sketch the 'timing diagram' of above with proper label.

(15 marks)

Question 4 :

- (4) (a) Discuss **TWO (2)** sources of noises in wireless transmission and **THREE (3)** reasons why TM Unified internet connection are preferred over P1 internet connection. (10 marks)

- (b) A fiber optical system in the laboratory is using laser diode as light source at 850 nm, the capacitance is 3pF and the rise time is 2ns and optical power is 1W. The refractive index of core is 1.5 and the refractive index of cladding is 1.46. The cable is 2km and cable loss is 4dB/km. The macroband of 4dB occurs at 1km. The connector loss is 1dB. There are two connectors at start and end and no margin is required for safety and aging. The receiver is using APD (Avalanche Photo Diode).
- (i) Calculate the bandwidth and maximum load allowed. (2 marks)
 - (ii) Calculate the critical angle of the fiber and cone of acceptance. (2 marks)
 - (iii) Calculate two Fresnel losses for the fiber. (2 marks)
 - (iv) Sketch OTDR test result for this system and explain the result. (5 marks)
 - (v) Determine the available power of APD. (4 marks)

Question 5

- (5) (a) With a simplified monochrome television transmitter block diagram, label five major blocks and describe their role in video and audio transmission. (10 marks)
- (b) A 24 channel T1 PCM carrier telephone system has a band limits input voice frequencies in each channel to 4kHz. The dynamic range required is 48dB. T1 is using TDM scheme of pulse width 0.625 μ s for multiplexing the signals.
- (i) Minimum sampling rate for PCM (Pulse Coded Modulation).
 - (ii) Quantization level required for linear PCM.
 - (iii) Number of bits required for each frame.
 - (iv) Minimum bandwidth for T1 wire.
 - (v) Describe two ways to signal the start of communication in telephone.
 - (vi) Describe two differences of TDM versus FDM.
 - (vii) Lists three dataset to connect data circuits to telephone loops. (15 marks)

Question 6

- (6) (a) Show a pictorial view of a magic tee and hybrid ring. Illustrate the magic tee application in detail. (10 marks)
- (b) The horn antenna gain is 20dB and the received signal power is 10mW at 5 meter from isotropic transmitter of 10GHz, the waveguide connected horn to receiver is 25cm and dimension is 2 cm x 1cm. The noise temperature is 17°C and bandwidth is 20MHz and noise figure is 10dB.
- (i) Determine the effective capture area of horn antenna. (2 marks)
 - (ii) Determine the power density at 20m from transmitter. (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) Calculate S/N ratio for horn antenna of above system. (3 marks)