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

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2014**
Programme	:	DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING
Course	:	**EEE 2111 : TELECOMMUNICATION SYSTEM**
Date of Examination	:	December 6, 2014 (Saturday)
Time	:	2.00pm – 4.00pm 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 :

Non-Programmable Scientific Calculator

Materials provided :

Bessels Function Table

Examiner(s) : **Mr. Meenakshi Sundaram**

Moderator : **Dr. Vincent Khoo**

This paper consists of _6_ printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEE)

EEE2111: TELECOMMUNICATION SYSTEMS
FINAL EXAMINATION: AUGUST 2014 SESSION

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

Question 1:

a) Discuss any three environmental factors that can affect the transmission and reception of wave in electronic communication.

(6 marks)

b) Consider a base station transmitting to a mobile station in free space. The following parameters relate to this communication system
- distance between base station and mobile station: 8 km
- transmitter frequency: 1.5 GHz
- base station transmitting power: 10 W
- total system losses: 8 dB
- mobile receiver noise figure: 5 dB
- mobile receiver antenna temperature: 290 K
- mobile receiver bandwidth : 1.25 MHz
- Antenna gains are 8 dB and 0 dB for the base station and mobile station respectively
- antenna height at the base station and mobile station are 30 m and 3m respectively.

Calculate (i) the received signal power at the mobile receiver antenna and (ii) signal-to-noise ratio (SNR) of the received signal.

(15 marks)

c) N signal coded into 8 bit Pulse Code Modulation are time division multiplexed into one channel. Determine the minimum transmission bandwidth needed for N = 24 and N = 32 if each signal is a standard voice signal of 4 kHz.

(4 marks)

Question 2:

a) Why does one need to convert digital signals to analogue signals when transmitting data?

(5 marks)

b) Why is a telephone channel normally sampled at a rate of 8000 samples per second? What are the disadvantages if the sampling frequency is higher or lower than that?

(6 marks)

c) A digital television system has a source analogue video signal with a bandwidth extending from 0 Hz to 2 MHz. This signal is sampled at four times the highest frequency using a 16-bit A/D converter. The resulting data signal is sent over the air using a 16-QAM modulation format. What is the bandwidth occupied by the transmitted digital video signal?

(8 marks)

d) What are single tone and multi tone modulation?

(6 marks)

Question 3:

a) Discuss the merits of digital communications..

(6 marks)

b) Why is synchronization very important in time division multiplexing?

(2 marks)

c) A 1000 MHz carrier is frequency-modulated by a 10V 10 kHz sinusoidal voltage using a linear modulator. The instantaneous carrier frequency varies between 99.95 and 100.05 MHz.
Calculate the:-

i) Sensitivity of the modulator.

(2 marks)

ii) Modulation index

(2 marks)

iii) Peak phase deviation of the carrier.

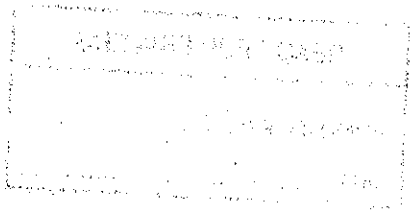
(2 marks)

d) Discuss the PCM and TDM applications for T-1 carrier.

(7 marks)

e) A microwave link consists of repeaters at 50km intervals. Calculate the minimum height of transmitting antenna and receiving antenna to ensure a line of sight condition. Given the height of transmitting antenna is twice of the height of receiving antenna.

(4 marks)



Question 4:

(a) Define the following terms:

i) Bandwidth (2 marks)

ii) Equalizers. (2 marks)

iii) ISI (2 marks)

iv) Aperiodic signal. (2 marks)

v) Periodic Signals (2 marks)

(b) An FM signal expressed as $V(t) = 50Cos(2\pi 10^7 t + 0.5Cos2\pi 10^4 t)$ is measured across a Ω antenna. Determine the following:

(i) Total antenna power (2 marks)

(ii) Modulation Index (shows the steps to derive it) (3 marks)

(iii) Peak frequency deviation (1 marks)

(iv) Bandwidth based on Carson's rule (2 marks)

(v) Power of the first side band at the antenna (2 marks)

(vi) Sum of all side band power at the antenna. (5 marks)

Question 5:

a) An analogue signal, band limited to a standard voice frequency (telephone) channel is sampled at the usual rate and coded into 8 bit samples.

i) How many sample height levels are there? (2 marks)

ii) What is the quantization interval for a 10V range? (2 marks)

iii) What bandwidth is required for the coded samples? (2 marks)

iv) Is it generally thought better to send a PCM signal rather than just a sampled (PAM) one?

(3 marks)

v) Why not use fewer bits sample? Or perhaps more?

(3 marks)

b) Explain in detail about Double Side Band Amplitude Modulation and prove mathematically that the amplitude modulated signals consists of three different frequency components.

(10 marks)

c) Define sampling theorem.

(3 marks)

Question 6:

a) Define polarization of electromagnetic wave and describe how to receive the maximum transmitted signal

(6 marks)

b) Draw the block diagram of the PCM system and explain how it works?

(7 marks)

c) Define the following terms

i) isotropic source

(2 marks)

ii) isotropic medium

(2 marks)

d) Suppose the signal to noise ratio at the input of an amplifier is 25dB and its NF is 10dB. Find the signal to noise ratio at the amplifier output.

(4 marks)

e) Describe the ground wave propagation method in brief and explain its application

(4 marks)

--THE END--

Bessel Function Table

Bessel Functions $J_n(\beta)$ shown to 4 decimal places.

β	$J_0(\beta)$	$J_1(\beta)$	$J_2(\beta)$	$J_3(\beta)$	$J_4(\beta)$	$J_5(\beta)$	$J_6(\beta)$	$J_7(\beta)$	$J_8(\beta)$	$J_9(\beta)$	$J_{10}(\beta)$	
0.1	0.9975	0.0499	0.0012									
0.2	0.9900	0.0995	0.0050	0.0002								
0.4	0.9604	0.1960	0.0197	0.0013	0.0001							
0.6	0.9120	0.2867	0.0437	0.0044	0.0003							
1.0	0.7652	0.4401	0.1149	0.0196	0.0025	0.0002						
1.5	0.5118	0.5579	0.2321	0.0610	0.0118	0.0018	0.0002					
2.0	0.2239	0.5767	0.3528	0.1289	0.0340	0.0070	0.0012	0.0002				
3.0	-0.2601	0.3391	0.4861	0.3091	0.1320	0.0430	0.0114	0.0025	0.0005	0.0001		
4.0	-0.3971	-0.0660	0.3641	0.4302	0.2811	0.1321	0.0491	0.0152	0.0040	0.0009	0.0002	
5.0	-0.1776	-0.3276	0.0466	0.3648	0.3912	0.2611	0.1310	0.0534	0.0184	0.0055	0.0015	
6.0	0.1506	-0.2767	-0.2429	0.1148	0.3576	0.3621	0.2458	0.1296	0.0565	0.0212	0.0070	
7.0	0.3001	-0.0047	-0.3014	-0.1676	0.1578	0.3479	0.3392	0.2336	0.1280	0.0589	0.0235	
8.0	0.1717	0.2346	-0.1130	-0.2911	-0.1054	0.1858	0.3376	0.3206	0.2235	0.1263	0.0608	
9.0	-0.0903	0.2453	0.1448	-0.1809	-0.2655	-0.0550	0.2043	0.3275	0.3051	0.2149	0.1247	
10.0	-0.2459	0.0435	0.2546	0.0584	-0.2196	-0.2341	-0.0145	0.2167	0.3179	0.2919	0.2075	