INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session : **August 2015**

Programme : Diploma in Electrical and Electronic Engineering (DEEI)

Course : **EEE2107: Introduction to Communication**

Date of Examination : 8th December 2015 (Tuesday)

Time : 11:00am – 1:00pm

Duration : 2 Hours Reading Time : Nil

Special Instructions :

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

IMPORTANT NOTE : THIS PAPER SHOULD NOT BE TAKEN OUT OF THE EXAMINATION HALL

Materials Permitted :

Nil

Materials Provided :

Bessel Function Table

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

Moderator : Dr. Mandeep Singh

This paper consists of 6 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE2107: INTRODUCTION TO COMMUNICATION
FINAL EXAMINATION: AUGUST 2015 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) Name and explain the three basic analogue modulation schemes.
(6 marks)

b) Draw and explain on Pulse Amplitude Modulation.
(6 marks)

c) Explain and describes the two noises involved in Delta Modulation (DM).
(9 marks)

d) If a cellular operator is allotted 12.5 MHz for each simplex band and if the total bandwidth (B_t) is 12.5 MHz, guard bandwidth (B_{guard}) is 10 kHz and the channel bandwidth (B_c) is 30 kHz, calculate the number of channels available in a Frequency Division Multiple Access (FDMA) system.
(4 marks)

Question 2:

a) What is the minimum bandwidth required to support a 256 kbps data stream using:
i) BPSK (Binary Phase Shift Keying)
(3 marks)

ii) QPSK (Quadrature Phase Shift Keying)
(3 marks)

iii) 64 QAM. (Quadrature Amplitude Modulation)
(3 marks)

b) Explain in detail on Time Division Multiplexing (TDM) with a sketch to show a 6-channel Time Division Multiplexing system that includes the transmitter and receiver ends.
(7 marks)

c) Consider a FDMA system for multimedia data users in which the modulation format requires 10 MHz of spectrum for each user and guard bands of 1 MHz are required on each side of the allocated spectrum in order to minimize out of band interference. Calculate the total bandwidth is required to support 100 simultaneous users in this system?
(3 marks)

d) What is the purpose of modulation?

(6 marks)

Question 3:

a) Determine the system Noise Temperature (T_{sys}) in °K of a satellite receiver station in order to maintain a constant Figure of Merit equal to 40.7 dB with a receiver antenna gain of 55 dB.

(7 marks)

b) Why is synchronization very important in Time Division Multiplexing (TDM)?

(3 marks)

c) A receiver has an input power of 42.2 mW while the noise power is 33.3 μW. Calculate the signal to noise ratio (SNR) for the receiver in dB.

(6 marks)

d) Illustrate and explain what aliasing means and how it can be prevented?

(4 marks)

e) Suppose the Signal to Noise Ratio (SNR) at the input of an amplifier is 25 dB and its Noise Figure (NF) is 10dB. Calculate the signal to noise ratio at the amplifier output in dB.

(5 marks)

Question 4:

a) What are single tone and multi tone modulation?

(5 marks)

b) A Non-modulated carrier wave of a Frequency Modulation (FM) signal can be represented by $V_c(t) = 10Cos(2\pi 10^6 t)$ This carrier wave is modulated with a signal $V_m(t) = 2Cos(2\pi 10^4 t)$ resulting in a FM signal with modulation index of 2.

(i) Calculate the Carson's bandwidth requirement for the modulated signal using Bessel function.

(2 marks)

(ii) Plot the spectrum (magnitude and phase) of the modulated signal.

(6 marks)

(iii) Calculate the combined power of the carrier and all the sideband (within the Carson's bandwidth) of the modulated signal.

(4marks)

c) A digital mobile communication system has a forward channel frequency band ranging between 810 MHz to 826 MHz and a reverse channel band between 940 MHz to 956 MHz Assume that 90 percent of the bandwidth is used by traffic channels. It is required to support at least 1150 simultaneous calls using FDMA. The modulation scheme employed has a spectral efficiency of 1.68 bps/Hz. Assuming that the channel impairments necessitate the use of rate ½ FEC codes, calculate the upper bound on the transmission bit rate that a speech coder used in this system should provide?

(8 marks)

Question 5:

a) Give the advantages and disadvantages of Amplitude Shift Keying (ASK), Phase Shift Keying (PSK) and Frequency Shift Keying (FSK) modulation.

(6 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)

d) 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)

Question 6:

a) Find the odd and even components of the continuous-time signal $f(t)= t^2+4t^3+6t^5$

(6 marks)

b) Discuss the two types of noise source generally encountered.

(8 marks)

c) During a binary digital transmission, 4.6 Mbytes of data are received in 73.6 seconds. Among that 368 bits are received in error. Calculate the:-

(i) Transmission rate.

(1 mark)

(ii) Bit error rate.

(1 mark)

(iii) Bit error ratio.

(1 mark)

(iv) Bandwidth required, if the special efficiency is 2 bits/Hz.

(1 mark)

(v) Estimated probability of error

(1 mark)

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

(6 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	