

**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 : **EEE2107 : Introduction to Communication**

Date of Examination : 7 March 2013

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) : **V.Meenakshi**

Moderator : **Dr. Mandeep Singh**

This paper consists of 5 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEE)
DIPLOMA IN MICROELECTRONIC ENGINEERING PROGRAMME (DMI)
DIPLOMA IN TELECOMMUNICATION ENGINEERING PROGRAMME (DTE)

EEE2107: INTRODUCTION TO COMMUNICATION
FINAL EXAMINATION: JANUARY 2013 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) Define the following terms
- (i) Random signal (2 marks)
 - (ii) Even signal (2 marks)
 - (iii) Multiplexing. (2 marks)
 - (iv) Aperiodic signal. (2 marks)
 - (v) Periodic Signals. (2 marks) / 0
- (b) An FM signal expressed as $V(t) = 50\cos(2\pi 10^7 t + 0.5\cos 2\pi 10^4 t)$ is measured across a 50Ω antenna. Determine the following
- (i) Total antenna power (2 marks)
 - (ii) Modulation Index (shows the steps to derive it) (4marks)
 - (iii) Peak frequency deviation (1 mark)
 - (iv) Bandwidth based on Carson's rule (2 marks)
 - (v) Power of the first side band at the antenna. (4marks)
 - (vi) Sum of all side band power at the antenna. (2 marks)

15

Question 2

- (a) Consider a Frequency Division Multiple Access (FDMA) system for multimedia data users. 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. (a) What total bandwidth is required to support 100 simultaneous users in this system? (b) Also consider a digital system with the same user spectrum and same guard bands as above on the band edges. How many users can this digital system support for the same total bandwidth? (8 marks)
- (b) Draw and explain on Pulse Amplitude Modulator (PAM). (10 marks)
- (c) Define Sampling theorem. (3 marks)
- (d) Discuss about Inter Symbol Interference. (4 marks)

Question 3

- (a) Discuss the comparison between TDMA and FDMA. (8 marks)
- (b) Illustrate and explain what aliasing means and how it can be prevented? (4 marks)
- (c) The antenna current of an Amplitude Modulation (AM) transmitter is 8 A when only carrier is sent. It increases to 8.93A when the carrier is modulated by a single sine wave. Find the percentage of modulation. (4 marks) 16
- (d) The 24 channel T1 Pulse Code Modulation carrier telephone system bandwidth limits of input voice frequencies in each channel to 4 kHz. The ratio of maximum voice level gives a dynamic range of 72 dB, Calculate
- i) minimum Sampling rate (2 marks)
 - ii) number of bit required to quantize it for dynamic range of 72 dB (4 marks)
 - iii) the required bit rate at the output of the multiplexer (3 marks) 9

Question 4

- (a) (i) With the aid of a diagram explain the advantages of Delta modulation as well as the two noises involved in Delta Modulation. (7 marks)
- (ii) Discuss the merits of digital communications. (6 marks)
- (b) (i) Write an equation to find the received power, P_r , at the receiving antenna (mobile station), of antenna gain G_m located at a distance 'd' from the transmitter (base station) of transmitting wavelength λ and antenna gain G_b and transmitting power P_t for free space propagation with considering other system losses. Also define each factor. (5 marks)
- (ii) Draw the block diagram of the Pulse Code Modulation system and explain how it works? (7 marks)

Question 5

- (a) (i) 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 $\frac{1}{2}$ FEC codes, find the upper bound on the transmission bit rate that a speech coder used in this system should provide? (8 marks)
- (ii) What are single tone and multi tone modulation? (6 marks)
- (b) Discuss the PCM and TDM applications for T-1 carrier. (8 marks)
- (c) Define Noise Figure. (3 marks)

Question 6

- (a) i) A receiver has an input power of 42.2 mW while the noise power is 33.3 μ W. Calculate the Signal to Noise Ratio for the receiver. (3 marks)
- ii) Find the transmission bit rate if the baud rate is 1200 and there are two bits per symbol or single transition. (2 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.

(14 marks)

(c) A modem transmits using an eight-level signaling technique. If each signaling element has a duration of 0.8333ms, determine

i) the baud rate

(3 marks)

ii) the bit rate

(3 marks)

--THE END--

EEE 2107/ (F)/January 2013/ V.Meenakshi Sundaram/date

Bessel Function Table

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

β	$J_0(\beta)$	$J_1(\beta)$	$J_2(\beta)$	$J_3(\beta)$	$J_4(\beta)$	$J_5(\beta)$	$J_6(\beta)$	$J_7(\beta)$	$J_8(\beta)$	$J_9(\beta)$	$J_{10}(\beta)$	$J_{11}(\beta)$	$J_{12}(\beta)$	$J_{13}(\beta)$	$J_{14}(\beta)$	$J_{15}(\beta)$	$J_{16}(\beta)$	$J_{17}(\beta)$	$J_{18}(\beta)$	
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	0.0004	0.0001							
6.0	0.1506	-0.2767	-0.2429	0.1148	0.3576	0.3621	0.2458	0.1296	0.0565	0.0212	0.0070	0.0020	0.0005	0.0001						
7.0	0.3001	-0.0047	-0.3014	-0.1676	0.1578	0.3479	0.3392	0.2336	0.1280	0.0589	0.0235	0.0083	0.0027	0.0008	0.0002	0.0001				
8.0	0.1717	0.2346	-0.1130	-0.2911	-0.1054	0.1858	0.3376	0.3206	0.2235	0.1263	0.0608	0.0256	0.0096	0.0033	0.0010	0.0003	0.0001			
9.0	-0.0903	0.2453	0.1448	-0.1809	-0.2655	-0.0350	0.2043	0.3275	0.3051	0.2149	0.1247	0.0622	0.0274	0.0108	0.0039	0.0013	0.0004	0.0001		
10.0	-0.2459	0.0435	0.2546	0.0584	-0.2196	-0.2341	-0.0145	0.2167	0.3179	0.2919	0.2075	0.1231	0.0634	0.0290	0.0120	0.0045	0.0016	0.0005	0.0002	