

**INTI**INTERNATIONAL COLLEGE PENANG (507232-U)  
LAUREATE INTERNATIONAL UNIVERSITIESFINAL  
Examination Paper

(COVER PAGE)

Session : April 2013

Programme : Diploma in Electrical and Electronic Engineering Programme

Course : **EEE2107 : Introduction to Communication**

Date of Examination : 30 July 2013

Time : 8a.m. – 10a.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 : **Wong Kam Mun**

*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: APRIL 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 by giving examples for each one, all definitions carries equal marks.
- (i) Continuous Signals.
  - (ii) Random Signals.
  - (iii) Deterministic Signals.
  - (iv) Power Signals.
  - (v) Periodic Signals.
- (10 marks)
- (b) During a binary digital transmission, 4.6Mbytes of data are received in 73.6 seconds. 368 bits are received in error. Calculate (i)the transmission rate;(ii) the bit error rate;(iii) the bit error ration;(iv)the bandwidth required, if the special efficiency is 2 bits/Hz;(v)the estimated probability of error.
- (5 marks)
- (c) Discuss the two types of noise source generally encountered.
- (5 marks)
- (d) If 20 audio channels are to be transmitted using DSB-AM in the bandwidth between 10.8 MHz and 11.2 MHz, what is the guard band if the audio signals have a maximum signal frequency of 8 KHz?
- (5 marks)

**Question 2**

- (a) Draw and explain the architecture of super heterodyne receivers and explain how this can overcome the limitations of Tuned Radio Frequency receivers.
- (12 marks)
- (b) A carrier of 200 kHz with amplitude of 2V is frequency modulated by a signal,  $m(t) = 3 \cos(6\pi 10^3 t)$  with a modulation index of 4. Calculate:
- (i) The frequency deviation ( $\Delta f$ ).
  - (ii) The frequency modulation sensitivity (K).
  - (iii) The maximum and minimum instantaneous frequencies (fi).
  - (iv) The Carson bandwidth.
- (8 marks)

- c) What is frequency division multiple access? Give an example of such a scheme? (5 marks)

### Question 3

- (a) Compare the techniques, advantages and disadvantages of TDMA, FDMA. (8 marks)
- (b) Illustrate and explain what aliasing means and how it can be prevented? (4 marks)
- (c) Discuss about Inter Symbol Interference. (5 marks)
- (d) The 24 channel T1 PCM 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
- minimum Sampling rate
  - number of bit required to quantize it for dynamic range of 72 dB
  - the required bit rate at the output of the multiplexer
- (8 marks)

### Question 4

- (a) (i) List and explain the TWO main types of noise associated with Delta Modulation. (6 marks)
- (ii) Discuss the merits of digital communications. (6 marks)
- (b) (i) Name THREE parameters of a carrier wave that can be modulated? Sketch the waveform of ASK, PSK and FSK digital transmissions for the bit stream 11010. (6 marks)
- (ii) Draw the block diagram of the PCM system and explain how it works? (7 marks)

### Question 5

- (a) (i) Determine the system noise temperature ( $T_{sys}$ ) of a satellite receiver station in order to maintain a constant figure of merit equal to 40.7dB with a receiver antenna gain of 55dB. (8 marks)
- (ii) What is single tone and multi tone modulation? (6 marks)

- (b) Briefly explain what you understand about TDM and with the help of a simple diagram show a 4-channel TDM system that includes the transmitter and receiver ends

(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 $\mu$ 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) April 2013: V.Meenakshi Sundaram/date*

## Bessel Function Table

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

$\beta$	$J_0(\beta)$	$J_1(\beta)$	$J_2(\beta)$	$J_3(\beta)$	$J_4(\beta)$	$J_5(\beta)$	$J_6(\beta)$	$J_7(\beta)$	$J_8(\beta)$	$J_9(\beta)$	$J_{10}(\beta)$	$J_{11}(\beta)$	$J_{12}(\beta)$	$J_{13}(\beta)$	$J_{14}(\beta)$	$J_{15}(\beta)$	$J_{16}(\beta)$	$J_{17}(\beta)$	$J_{18}(\beta)$	
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	-0.0550	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