



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE : FLD20603
SUBJECT TITLE : ELECTRONIC COMMUNICATION
LEVEL : DIPLOMA
TIME / DURATION : 9.00 AM – 11.30 AM
(2.5 HOURS)
DATE : 8 JANUARY 2015

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answers should be written in blue or black ink except for sketching, graphic and illustration.
5. This question paper consists of two (2) sections. Section A and B. Answer ALL questions in Section A. For Section B, answer TWO(2) questions only.
6. Answer all questions in English.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

- (a) State the main purpose of a communication system and draw its basic diagram.
(5marks)
- (b) Transmission lines play an important role in transferring information, explain the meaning of transmission lines in communication system.
(3 marks)
- (c) Briefly explain the meaning of electromagnetic spectrum and electromagnetic wave in communication.
(4 marks)
- (d) For example, a common type of cable used for cable TV has a propagation factor of 75% of c . Determine the actual velocity of the electromagnetic energy in this cable.
(3 marks)

Question 2

- (a) Explain the meaning of decibel and its application in communication system.
(4 marks)
- (b) A signal enters the circuit has been amplified by 13 dB and is measured at 1.2W, calculate its original value.
(3 marks)
- (c) Calculate the dBV value for 25.7V and 0.05V. Comment on both results.
(5 marks)
- (d) Express 0dBW in dBm.
(3 marks)

Question 3

- (a) Briefly explain the effects of noise to the communication system performance.
(3 marks)
- (b) Noise values in millivolts as follows are measured at various times: 0.3, 1.0, 0.2, 0.5, 0.6, -0.6, 0.3, 0.1, -0.15, and 0.9 V. Calculate the rms noise value.
(5 marks)
- (c) The convenience of using the dB scale, however, has resulted in the use of several common reference values in the electronics and communications industry, one of the common references is 1mW. Convert 200mW to the decibel scale by using this reference.
(4marks)
- (d) A signal enters the circuit with a value of 0.1V and is amplified to 5 V. The input and output resistances are the same. Calculate the gain of this circuit.
(3 marks)

Question 4

- (a) Prove that $0\text{dBm} = -30\text{dBW}$.
(5 marks)
- (b) An audio amplifier might have an output of 7dBW. Determine the output value in watts.
(2.5 marks)
- (c) Convert a signal of 0.05V to value in dBV.
(2.5marks)
- (d) A super-cooled antenna with $T_A = 40\text{ K}$ connected to a receiver with $T_R = 80\text{ K}$, the measured overall noise voltage is $300\mu\text{V}$ and the bandwidth is 3kHz. Calculate the equivalent noise resistance in this communication system. Given the Boltzmann's constant is $1.38 \times 10^{-23}\text{ J/K}$.
(5 marks)

SECTION B (Total: 40 marks)**INSTRUCTION: Answer only TWO (2) questions.****Please use the answer booklet provided.****Question 5**

- (a) Briefly explain the function of modulator in communication system.
(2 marks)
- (b) Explain the Amplitude Modulation and discuss the phenomena occurred when the amplitude of modulating signal is greater than amplitude of the carrier signal. Sketch amplitude modulated wave for this case.
(5 marks)
- (c) A 1600Hz signal which has amplitude of 30V, amplitude modulates (AM) a 50MHz carrier which when unmodulated has amplitude of 65V. Given $R_L = 20\Omega$.
- (i) Sketch the modulating and carrier signal.
(2 marks)
- (ii) Construct the modulated wave.
(1 mark)
- (iii) Calculate the modulation index.
(2 marks)
- (iv) Sketch the frequency spectrum of the modulated wave.
(2 marks)
- (v) Calculate the bandwidth.
(2 marks)
- (vi) Power contained in the carrier and the upper and lower sidebands.
(2 marks)
- (vii) Total power of the modulated wave.
(2 marks)

Question 6

The use of tuned LC circuits is found in every television, AM/FM receiver or other applications where tuning is important.

(a) **Refer to Figure 1.**

(i) With C set to 50pF, calculate f_0 , X_L , Q, V_C , and BW.

(7.5 marks)

(ii) With C set to 200pF calculate f_0 and BW. Also comment on bandwidth for both settings.

(3 marks)

(b) An LC circuit is to be designed so that it is capable of being tuning over a frequency range of 85kHz to 1145 kHz.

(i) Calculate the required tuning ratio of the variable capacitance.

(2 marks)

(ii) If the value of L is 120 μ H, calculate the value of C_{min} and C_{max} .

(7.5 marks)

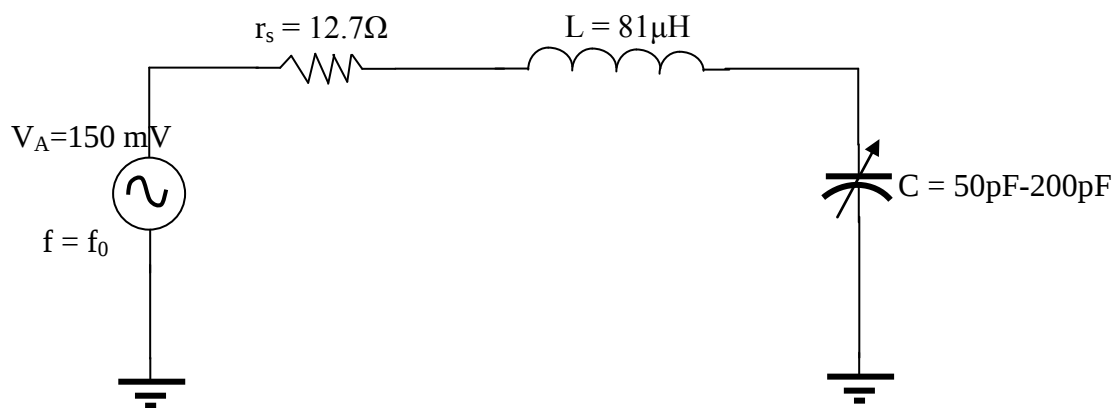


Figure 1

Question 7

A FM modulator has a modulation index of 2. The modulating signal is $V_m(t) = 8\cos(2\pi 12 \times 10^3 t)$ and the carrier is $V_c(t) = 12\cos(2\pi 5 \times 10^6 t)$. With the aid of a Bessel Function table as shown in Table 1, determine:

- The frequency deviation, frequency swing, maximum and minimum frequencies of the FM signal.
(6 marks)
- The number of sets of significant sidebands.
(2 marks)
- The amplitudes and the frequencies of the carrier and the significant sidebands.
(4 marks)
- The bandwidth.
(2 marks)
- List the advantages of FM compared to AM.
(6 marks)

Table 1: Bessel functions Table.

Modulation Index	Carrier	Sidebands (Pairs)															
		1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th
0.00	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.25	0.98	0.12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.5	0.94	0.24	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.0	0.77	0.44	0.11	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.51	0.56	0.23	0.06	0.01	—	—	—	—	—	—	—	—	—	—	—	—
2.0	0.22	0.58	0.35	0.13	0.03	—	—	—	—	—	—	—	—	—	—	—	—
2.5	-0.05	0.50	0.45	0.22	0.07	0.02	—	—	—	—	—	—	—	—	—	—	—
3.0	-0.26	0.34	0.49	0.31	0.13	0.04	0.01	—	—	—	—	—	—	—	—	—	—
4.0	-0.40	-0.07	0.36	0.43	0.28	0.13	0.05	0.02	—	—	—	—	—	—	—	—	—
5.0	-0.18	-0.33	0.05	0.36	0.39	0.26	0.13	0.05	0.02	—	—	—	—	—	—	—	—
6.0	0.15	-0.28	-0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02	—	—	—	—	—	—	—
7.0	0.30	0.00	-0.30	-0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02	—	—	—	—	—	—
8.0	0.17	0.23	-0.11	-0.29	-0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03	—	—	—	—	—
9.0	-0.09	0.24	0.14	-0.18	-0.27	-0.06	0.20	0.33	0.30	0.21	0.12	0.06	0.03	0.01	—	—	—
10.0	-0.25	0.04	0.25	0.06	-0.22	-0.23	-0.01	0.22	0.31	0.29	0.20	0.12	0.06	0.03	0.01	—	—
12.0	-0.05	-0.22	-0.08	0.20	0.18	-0.07	-0.24	-0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.07	0.03	0.01
15.0	-0.01	0.21	0.04	0.19	-0.12	0.13	0.21	0.03	-0.17	-0.22	-0.09	0.10	0.24	0.28	0.25	0.18	0.12

END OF QUESTION PAPER