Document No :UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

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SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FLB24063**
SUBJECT TITLE	:	**ELECTRONIC COMMUNICATION**
LEVEL	:	**BACHELOR**
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 three (3) questions only**
6. **Answer all questions in English.**

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) State thegoal of a communication systemand explain the simple process to achieve this goal.

(2marks)

(b) Transmission lines play an important role in transferring information, explain the meaning of transmission lines in communication system.

(3 marks)

(c) Define the meaning of wavelength and propagation velocity.

(3 marks)

(d) Calculate the wavelength for a signal with frequency 200MHz travelling through the cable with propagation factor value 75% of c.

(2 marks)

Question 2

(a) The function of any communications system is to carry information.
Regardless of the type of information, there is always one simple fact to remember, carrying information requires bandwidth. Define the meaning of bandwidth in communication system.

(2marks)

(b) A signal is amplified 100 times in power. Calculate the dB gain.

(1 mark)

(c) Prove that the power gain is 3dB when the output power is doubled.

(1 mark)

(d) Communication system can be designed for sending the information in various modes, briefly explains these transmission modes.

(3 marks)

(e) Define the meaning of information capacity and calculate the bandwidth needed if the information capacity is 20,000 bits/s when the ratio of signal power to noise power is 100.

(3 marks)

Question 3

(a) Explain how noise affects the communication system performance.

(2 marks)

(b) Given the input signal is 1W, the input noise is 0.01W and the output signal is 10W, the output noise power is 0.3W.Calculate the noise ratio and the noise figure of this system.

(2 marks)

(c) State the reasons why the decibel scale is ideal for calculating system performance especially in multi stage communication system.

(2marks)

(d) Noise can be classified into two(2) types. Explain by giving one example of each type.

(2 marks)

(e) Calculate the noise power at room temperature of 25°C when the bandwidth is 1kHz.

(2 marks)

Question 4

(a) State the main function of tuned LC circuit and define the resonance frequency.

(3marks)

(b) State one method to increase the quality, Q of tuned LC circuit.

(1 mark)

(c) An audio amplifier might have an output of 7dBW. Find the output value in watts.

(3marks)

(d) A super-cooled antenna with NT = 40 K connected to a receiver with NT = 80 K , the measured overall noise voltage is 300μV and the bandwidth is 3kHz. Find the equivalent noise resistance in this communication system.Given theBoltzmann's constant is 1.38×10^{-23} J/K.

(3 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.
Please use the answer booklet provided.

Question 5

Using Fourier analysis, the equation that describes the signal in one domain, with equal validity, can be transformed into the equation that describes the signal in the other domain.

(a) The two different domains are frequency domain and time domain. Spectrum Analyzer is used to analyze the signal in which domain?

(2 marks)

(b) List three ways to obtain frequency domain representation from the time domain representation.

(6 marks)

(c) Sketch the signal in each domain if the frequencies are 100Hz and 200Hz in one signal with 2 volt amplitude.

(3 marks)

(d) One way to build the spectrum analyzer is by using band-pass filter. By sketching the related figure, explain the band-pass filter.

(3 marks)

(e) Define the periodic and non-periodic signals.

(3 marks)

(f) The Fast Fourier Transform (FFT) is used to obtain frequency domain which can be performed by a computer or microprocessor. Briefly explain how FFT perform.

(3 marks)

Question 6

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

Figure 1 shows a parallel LC circuit which is sometimes called a tank circuit. At resonant frequency, inductive reactance is equal to the capacitive reactance. By referring to **Figure 1**;

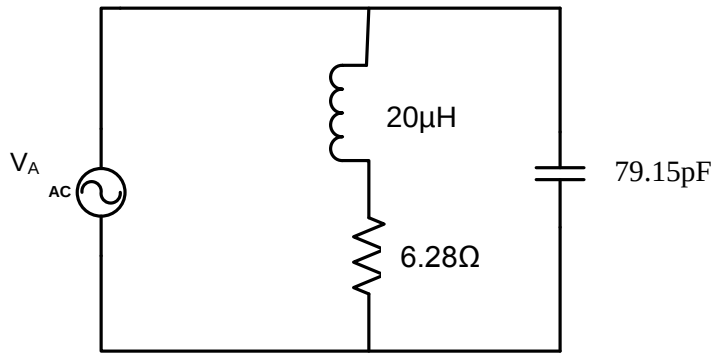

Figure 1

(a) Draw the resonant response curve.

(2 marks)

(b) Briefly explain the response curve in (a).

(2 marks)

(c) Calculate the resonant frequency and inductive reactance.

(4 marks)

(d) Calculate the Quality and Z_{TANK}.

(4 marks)

(e) Determine the bandwidth.

(2 marks)

(f) If a 20kΩ load has been placed across the tank. Calculate Qckt and the new bandwidth.

(4 marks)

(g) Also comment on bandwidth for question (f).

(2 marks)

Question 7

(a) Briefly explain the function of a modulator in a communication system.

(2 marks)

(b) Explain the meaning of Amplitude Modulation and discuss the phenomena that 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 un-modulated has amplitude of 65V. Given RL=20Ω.

(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 in the upper and lower sidebands.

(2 marks)

(vii) Total power of the modulated wave.

(2 marks)

Question 8

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

(a) The frequency deviation, frequency swing, maximum and minimum frequencies of the FM signal.

(6 marks)

(b) The number of sets of significant sidebands.

(2 marks)

(c) The amplitudes and the frequencies of the carrier and the significant sidebands.

(4 marks)

(d) The bandwidth.

(2 marks)

(e) 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