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SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE	:	FLD 20603/FLB 30303
SUBJECT TITLE	:	ELECTRONIC COMMUNICATION
LEVEL	:	DIPLOMA
TIME / DURATION	:	3 HOURS 2.00 pm - 5.00 pm
DATE	:	26 MAY 2014

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) List the four (4) main elements of a communication system, and draw a diagram that shows their relationship.

(5 marks)

(b) Name the device used to convert an information signal to a signal compatible with the medium over which it is being transmitted.

(2 marks)

(c) Define the electromagnetic wave radiation.

(3 marks)

Question 2

(a) Explain the use and the advantages of decibel in communication system.

(2 marks)

(b) A signal enters the circuit with a value of 0.2V and is amplified to 6V. The input and the output resistances are the same. Calculate the voltage gain in dB.

(3 marks)

(c) How are decibels used in communication systems? Explain the principles involved.

(3 marks)

(d) A new communications cable is installed and the signal level, in volts increases by one half. Calculate the increase in dB.

(2 marks)

Question 3

(a) Explain how noise affects the original communication signal.

(2 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 0.9V. Calculate the rms noise value.

(3 marks)

(c) An antenna with noise temperature = 45 K is connected to a receiver input with noise temperature = 260 K. Calculate the overall noise temperature, noise ratio, and noise figure?

(3 marks)

(d) A signal arrives at the preamplifier of a receiver with a signal power of 10μ W and a noise power of 0.5μ W. Determine the signal to noise ratio of the preamplifier.

(2 marks)

Question 4

(a) Express 0dBW in dBm.

(3 marks)

(b) A signal has been amplified by 13dB and is measured at 1.2W. Calculate the original value.

(2 marks)

(c) A signal of 8.2v corresponds to what value in dBV .

(2 marks)

(d) Given the temperature is 300K and the bandwidth is 3kHz.Calculate the equivalent noise resistance when the measured noise is 300μV.

(3 marks)

SECTION B (Total: 60 marks)

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

Question 5

An audio signal 15 cos 2π(150t) amplitude modulated a carrier 60 cos 2π (1000kt).

(a) Define Amplitude Modulation (AM).

(2 marks)

(b) Sketch the modulating and the carrier signals.

(2 marks)

(c) Construct the modulated wave.

(2 marks)

(d) Calculate the modulation index.

(2 marks)

(e) Sketch the frequency spectrum of the modulated wave.

(3 marks)

(f) Calculate the bandwidth.

(2 marks)

(g) Write the trigonometric equation for the modulated wave.

(3 marks)

(h) State the advantages and disadvantages of Amplitude Modulation.

(4 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**;

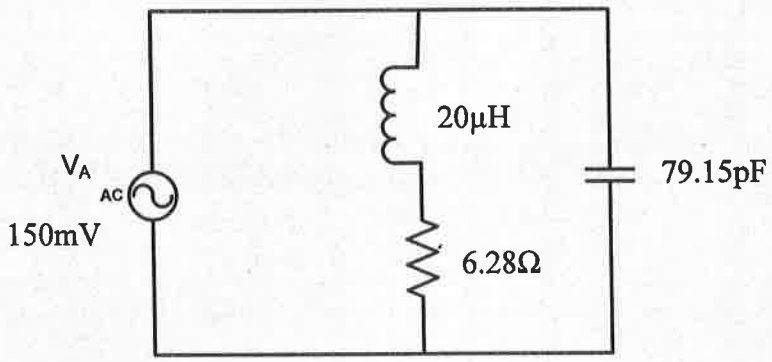

Figure 1

(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 27kΩ 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

The AM modulator receives two signals, the modulating and the carrier signals. The modulator circuit combines these two signals producing an AM signal which is passed on to the transmission medium.

(a) The total power content of an AM signal is 100W. Determine the power being transmitted at the carrier frequency and at each of the sidebands when the modulation percentage is 20% and 60%.

(6 marks)

(b) Derive the equation for the total power content in AM signal.

(6 marks)

(c) For an AM modulator with a 150 kHz carrier and a 10 kHz signal, determine the frequency for the upper and lower sidebands.

(4 marks)

(d) From (c), sketch the output frequency spectrum.

(2 marks)

Question 8

A FM modulator has a modulation index of 2. The modulating signal is $Vm(t) = 5\cos 2\pi(12 \times 10^3 t)$ and the carrier is $Vc(t) = 8 \cos 2\pi(5 \times 10^6 t)$. 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