



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE : LEB20103
COURSE NAME : ELECTRONIC COMMUNICATION 1
PROGRAMME NAME : BACHELOR
DATE : 18 JANUARY 2016
TIME : 2.00PM – 5.00PM
DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper .
 2. This question paper is printed on both sides of the paper.
 3. This question paper consists of **TWO (2)** sections; Section A and Section B.
 4. Answer **ALL** questions in Section A. For Section B, answer **THREE (3)** questions.
 5. Please write your answers on the answer booklet provided.
 6. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 7. Answer all questions in English.
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THERE ARE 11 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

(a) In the communication system channel, radio channel is known as the wireless communication which are using the concept of electromagnetic wave to propagate in the free space. In general, there are 3 types of wave propagation namely ground, sky wave and space wave propagation. By using your own words, give 2 differences for each type of wave propagation. (CLO1)

(6 marks)

(b) Figure 1 shows the cascaded of the amplifier. Answer the following questions. (CLO1)

i. Determine the total voltage and power gain

(2 marks)

ii. Given $V_2 = 2.5V$, determine the value of V_1 and V_3

(2 marks)

iii. Given the value of $P_1:P_3 = 2:1$, determine the value of P_1 and P_3 in watt

(3 marks)

iv. Determine the value of R_1 and R_3

(2 marks)

v. Determine the total power dissipated due to connection between Amp1 and Amp2

(5 marks)

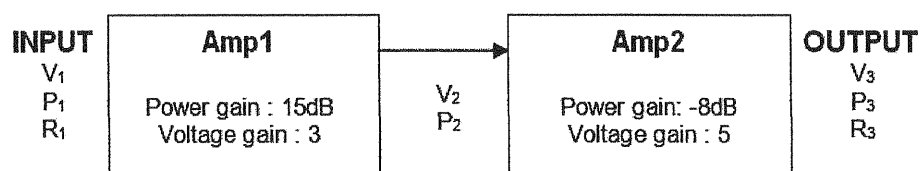


Figure 1 : Cascaded amplifier

Question 2

- (a) Determine the difference between Amplitude Modulation (AM) and Frequency Modulation (FM) process. (CLO2)

(4 marks)

- (b) The AM signal, the $V_{\max_{pp}}$ value read from the graticule on the oscilloscope screen is 5 divisions and $V_{\min_{pp}}$ is 1.2 divisions. (CLO2)

- i. Determine the modulation index

(2marks)

- ii. From the reader observation, the value for $V_{\max_{pp}}$ is 10V from the oscilloscope screen. If the same scale is applied for all parameters, determine the actual value for $V_{\min_{pp}}$

(2 marks)

- iii. Given the total power, P_T is 48W, determine the P_C

(2 marks)

- iv. Given the value of modulated signal impedance is 23Ω , determine the value of V_m

(4 marks)

- (c) Draw the frequency spectrum, which represents the frequency and voltage of the signal of V_1 and V_2 : (CLO2)

$$V_1 = 65 \cos 980k \pi t$$

$$V_2 = 16.25 \cos 70k \pi t$$

(6 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) ONLY from FOUR (4) questions.

Please use the answer booklet provided

Question 3

- (a) With the help of a diagram, determine the term of carrier swing, maximum and minimum frequency. (CLO2)

(4 marks)

- (b) An FM signal is given by: (CLO2)

$$v_{FM}(t) = 89.3 \cos [200 \pi \times 10^6 t + 1.0 \sin 2 \pi \times 10^3 t] \text{ V}$$

Determine the:

- i. Number of sidebands, frequency deviation and carrier swing frequency (3 marks)
- ii. Maximum and minimum frequencies (2 marks)
- iii. Power in the FM signal across 45 Ω load (1 marks)
- iv. Bandwidth using Bessel Function table (1 marks)
- v. Sketch and label the frequency spectrum (3 marks)

- (c) A frequency modulated signal which is modulated by a 3kHz sine wave reaches a maximum frequency of 100MHz and the minimum frequency of 99.98MHz.(CLO2)

Determine the:

- i. Carrier swings frequency (1 marks)
- ii. Frequency deviation (2 marks)
- iii. Carrier frequency (1 marks)
- iv. Modulation index of the signal (2 marks)

Question 4

(a) In general, the antenna can be used at the transmitting or receiving end. At the transmitting end, the antenna will convert the transmitter power into electromagnetic signal. While at the receiving end, the antenna will pick up the electromagnetic signal and convert it into the signal at the receiver. The electromagnetic wave uses both magnetic and electric concepts in wave propagation. (CLO3)

i. Based on Figure 4a, describe the concept of magnetic field around the conductor.

(4 marks)

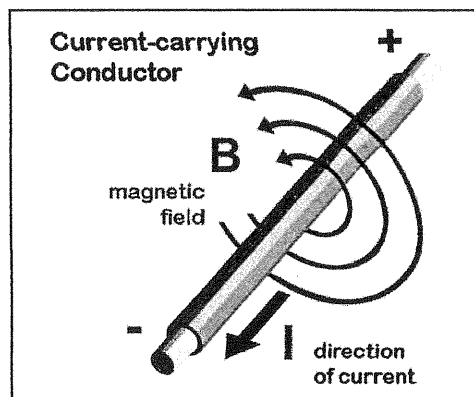


Figure 4a: Magnetic field

ii. Based on Figure 4b, describe the concept of the electric field.

(4 marks)

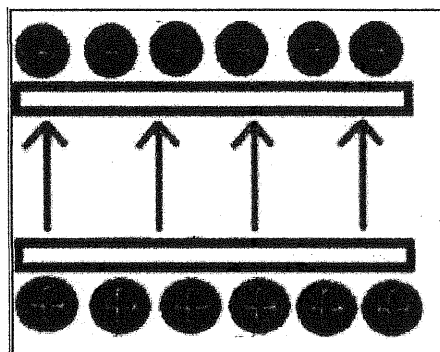


Figure 4b: Electric Field

(b) In practice, the antenna is connected at the open end of the transmission line. This topology greatly influence to get the reliable and efficient of wave radiation between the transmitter and antenna. Describe the reason behind this. (CLO3)

(4 marks)

(c) Figure 4c illustrates the movement of electric field and magnetic field which produced around the antenna rod in the transmission line. Based on your knowledge, describes in detail all information regarding the movement of these signals. (CLO3)

(4 marks)

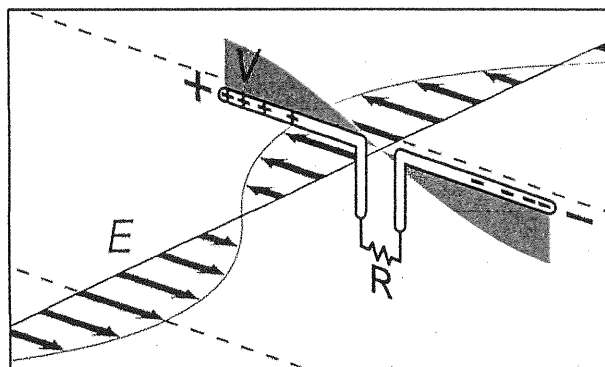


Figure 4c: Electric field and magnetic field in a transmission line

(d) Polarization refers to the orientation of the electric field and magnetic field with respect to the earth. Based on Figure 4d, what is the differences between these polarizations. (CLO3)

(4 marks)

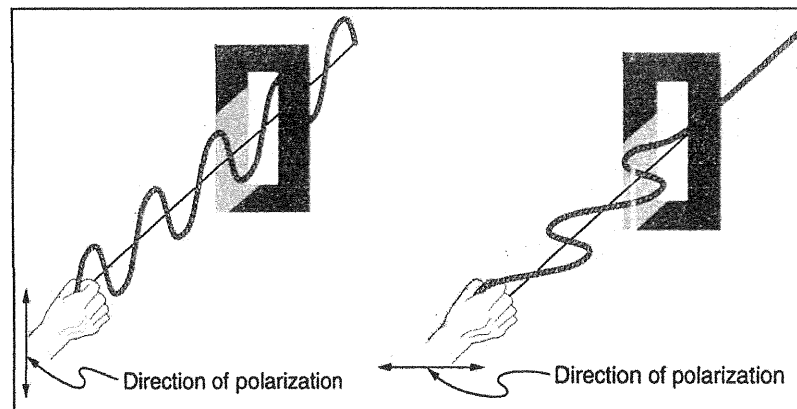


Figure 4d: Antenna polarization

Question 5

- (a) Antenna is a device that converts electric circuit to electromagnetic wave. By using your own words, describe the basic fundamental of the antenna structure. (CLO3)
(3 marks)
- (b) In the antenna operation, resonant condition is very important in order to ensure the system can archived the maximum of amplitude. By using your own words, elaborate the reasons behind this. Also, describe the resistivity of the antenna during system resonant in your explanation. (CLO3)
(5 marks)
- (c) Elaborate the relation between system resonance to the antenna wavelength with a suitable formula to support your answer. (CLO3)
(4 marks)
- (d) Elaborate the relation between resistance of transmission line and antenna in order to get the perfect of power transfer in the operation. (CLO3)
(4 marks)

- (e) Figure 5 shows the radiation pattern of a half wave dipole. By using your own words, describe about the radiation pattern and the directivity of a half wave dipole. (CLO3)

(4 marks)

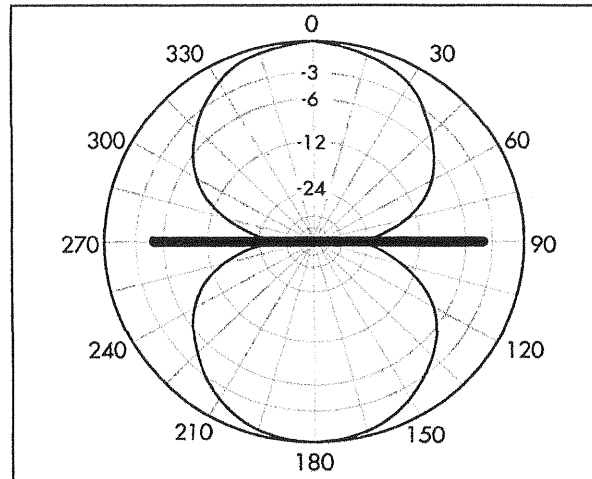


Figure 5: Radiation pattern of wave dipole

Question 6

- (a) A network is a communication system with two or more stations that can communicate with one another. There are four (4) basic types of network. List down all the networks. Hence, describe two (2) features of each network. (CLO4)

(8 marks)

- (b) Explain briefly three (3) advantages of fiber optic cables over the conventional electricity cables. (CLO4)

(6 marks)

- (c) Figure 6 shows the basic telephone with a simple analogue transceiver designed for converting speech of acoustical signals to electrical signal. From this figure, explain the operation of each component in a basic telephone set. (CLO4)

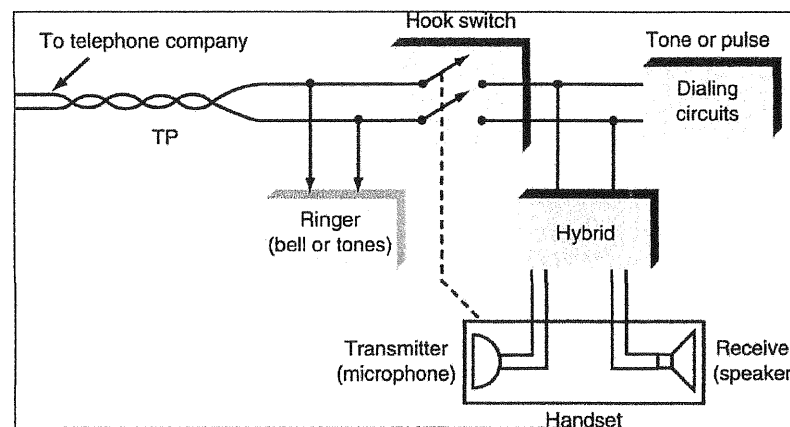


Figure 6: Basic telephone set

(6 marks)

END OF EXAMINATION PAPER

APPENDIX 1

Table 1: Bessel Function Table

Modulation Index	Carrier	Sideband (Pairs)															
		1st	2nd	3rd	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	-0.16	-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	-0.06	0.20	0.18	-0.07	-0.24	-0.17	0.05	0.23	0.30	0.27	0.30	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