UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2009/2010

SUBJECT NAME	:	COMMUNICATION ENGINEERING
SUBJECT CODE	:	DEK 3233
COURSE	:	3 DEE / 3 DET / 3 DEX
EXAMINATION DATE	:	NOV 2009
DURATION	:	2 ½ HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND ANSWER **TWO (2)** QUESTIONS ONLY IN **PART B**.

THIS PAPER CONSISTS OF 6 PAGES

PART A

Q1 (a) In communication systems there are two types of signals. Describe TWO (2) of the signals and its application.

(6 marks)

(b) A channel with signal to noise ratio of 75 is carrying a Ultra High Frequency (UHF) channel. What is the maximum capacity can be achieve using that channel.

(4 marks)

Q2 (a) In Amplitude Modulation (AM) under certain circumstances and circuit behavior the modulation index can be varied accordingly. Describe with its illustration:-

(i) under modulated,

(3 marks)

(ii) ideal,

(3 marks)

(iii) over modulated, and

(3 marks)

(b) Which modulation above has the signal which is tangible (contain audible/useful information)

(1 mark)

Q3 (a) In classification of uncorrelated noise describe each on the following type of external noise.

(i) Atmospheric noise,

(2 marks)

(ii) Extraterrestrial noise and

(2 marks)

(iii) Industrial noise.

(2 marks)

(b) A portable Bluetooth USB dongle has a 1mW of transmission power and a 10uW of noise power. The output has a Signal-to-Noise Ratio (SNR) value of 20. Compute the following:

(i) input SNR and

(2 marks)

(ii) noise Factor.

(2 marks)

Q4 (a) Wireless digital communication has now become more popular because of the capability to transport digital data over a wireless medium. Basically it involves digital modulation techniques. Explain the characteristics of the given modulation scheme below and then sketch its waveform to represent its function.

(i) Frequency Shift Keying (FSK) and

(5 marks)

(ii) Phase Shift Keying (PSK).

(5 marks)

PART B

Q5 (a) A local radio station is testing their new equipment for FM transmission. Therefore they transmit for a very short distance of an FM signal $v_{FM}(t) = 5 \sin(\pi \times 10^4 t - \cos 8\pi \times 10^3 t)$ and applied to the 75 ohm antenna. Determine:

(i) the modulation index, β,

(1 mark)

(ii) modulating frequency, f_m,

(2 marks)

(iii) frequency deviation Δf,

(2 marks)

(iv) bandwidth using Bessel function table,

(2 marks)

(v) bandwidth using Carson's rule,

(2 marks)

(vi) power in the largest & smallest sideband predicted by Bessel function table, and

(4 marks)

(vii) total power.

(3 marks)

(b) Describe TWO (2) advantages of angle modulation compare to amplitude modulation.

(4 marks)

Q6 (a) A transmission line consists of 2 conductors separated each other to guide an electromagnetic wave. Draw the equivalent transmission line with its labels. Then list THREE (3) examples of transmission line that you know.

(8 marks)

(b) An unshielded twisted pair (UTP) cable as shown in Figure Q6(b) is used to transmit 155 MHz signal in a networking system. It has relative dielectric contant of the insulating material of 4.6 and the velocity factor of 0.75. The line is terminated with a load having impedance of $60 + j50\ \Omega$.

Determine:

(i) the characteristic impedance of the UTP line,

(2 marks)

(ii) the propagation velocity of the line,

(1 marks)

(iii) the UTP's wavelength,

(1 marks)

(iv) standing Wave Ratio,

(4 marks)

(v) return loss in dB and

(2 marks)

(vi) percentage of transmitted power to the load.

(2 marks)

Q7 (a) Radio waves acts like a light waves. Therefore, the main characteristics of radio wave are similar to the light wave. Define the THREE (3) radio wave characteristic, its figure and the relevant equation if any.

(15 marks)

(b) A portable sonar and fish finder sends a signal against the sea water surface to the onboard computer. If the sea water has relative permeability $\mu_r = 1$ and relative permittivity $\varepsilon_r = 81$ while the air has a relative permittivity $\varepsilon_r = 1$, $\mu_r = 1.005$. Determine the followings:-

i. water refraction index,

(1 mark)

ii. air refraction index, and

(1 mark)

iii. critical Angle

(1 mark)

(c) Determine the radio horizon for a transmitting antenna that is 50 m high and a receiving antenna that is 125 m high.

(2 marks)

Q8 (a) Antenna array is a combination two or more antenna elements to form a single antenna. The field interact each other and produce a sum of resulting radiation pattern. Describe with the aid of a diagram.

(13 marks)

(b) For a transmitting antenna with a radiation resistance $R_r = 50\ \Omega$, an effective antenna resistance $R_e = 8\ \Omega$, a directive gain $D = 20$ and an input power is 10 W. Determine;

(i) percentage of antenna efficiency,

(1 marks)

(ii) antenna gain in dB,

(2 marks)

(iii) radiated power in dBm, and

(2 marks)

(iv) effective Isotropic Radiated Power (EIRP) in dBW.

(2 marks)

FINAL EXAMINATION

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Table 1: Bessel Function.

Modulation index	Carrier J_0	Sidebands J_1	J_2	J_3	J_4	J_5	J_6	J_7	J_8	J_9	J_{10}
0.0	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	0.06	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

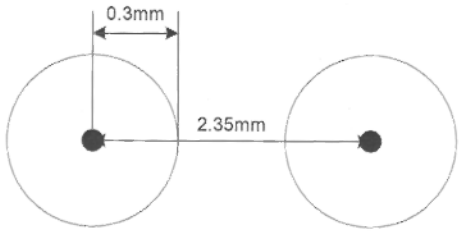

Figure Q6(b): Size and dimension of a UTP wire.

Constant:

Speed of light, C = 3.01 x 10^8 m/s
Boltzman, K = 1.38x10-23 J/K
Absolute temperature, example T = 17°C or 290K