SULIT

UNIVERSITI MALAYSIA PERLIS

Peperiksaan Pertengahan Semester II
Sesi Akademik 2019/2020

DKT 226 – Basic Communication Engineering
[Asas Kejuruteraan Perhubungan]

Masa: 1 Jam 30 Minit

Answer **ALL** questions.

QUESTION 1

(a) Define each of the following:
i) Information
ii) Noise
iii) Electronic communication system

(3 Marks)

(b) Briefly explain the elements of communications systems.

(6 Marks)

(c) A student uses equipment in communication lab to measure the output power for an AM receiver radio. The AM receiver radio comprises of an amplifier, a filter and a mixer with absolute power gain of $A_{p1} = 180$, $A_{p2} = 0.5$ and $A_{p3} = 65$ respectively. Given the input power, $P_{in} = 29$ dBm. Determine:

(i) The input power, P_{in} in mW.

(1 Mark)

(ii) The overall gain, A_{PT} in dB for the AM receiver.

(2 Marks)

(iii) The output power, P_{out} in watts and dBm.

(2 Marks)

$P_{in} \times P_{APT} = 29 \times$

QUESTION 2

(a) Differentiate coherent and non-coherent receivers.

(4 Marks)

(b) In TV receivers, the antenna is often mounted on a tall mast and a long lossy cable is used to connect the antenna and the receiver. In order to overcome the effect of the lossy cable, a pre-amplifier is mounted on the antenna as shown in Figure 1. Typical values of the parameters are also shown in **Figure 1**. Determine:

(i) The overall power gain, A_{PT} in dB.

(1 Mark)

(ii) The overall noise figure of the system.

(4 Marks)

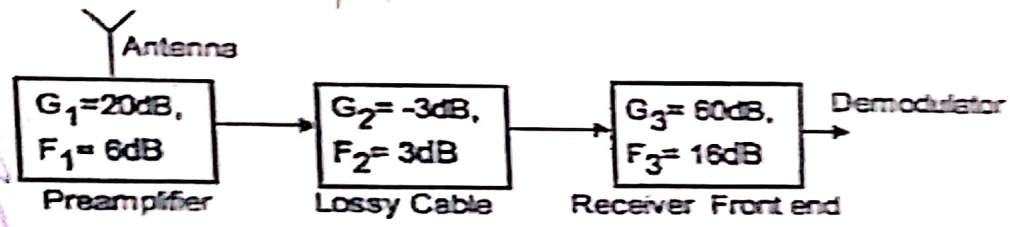

Figure 1

(c) One input to a conventional AM modulator is a 250 kHz carrier with amplitude of 18V_p and the second input is a 30 kHz modulating signal that is of sufficient amplitude to cause a change in the output wave of ±15V_p. Determine

(i) Upper and lower side frequencies.

(2 Marks)

(ii) Modulation index and percentage modulation.

(2 Marks)

(iii) Peak amplitude of the modulated carrier and upper and lower side frequency voltages.

(3 Marks)

(iv) Bandwidth of the AM waveform.

(1 Mark)

(v) Draw the output frequency spectrum.

(2 Marks)

QUESTION 3

(a) For an electronic device operating at a temperature of 25^0C with a bandwidth of 25 kHz, determine:
(Given constant k = 1.38×10^{-23} joules/Kelvin)

(i) Thermal noise power, P_N in watts and dBm (2 Marks)

(ii) RMS noise voltage, V_N for a 150Ω internal resistance and 50Ω load resistance. (2 Marks)

(b) An AM superheterodyne receiver using high-side injection with a preselector Q of 100. Given the intermediate frequency (IF) is 450 kHz and the RF carrier is 1000 kHz, determine:

(i) Local oscillator frequency, f_{LO}. (2 Marks)

(ii) Image frequency, f_{IM}. (2 Marks)

(iii) Image frequency rejection ratio (IFRR). (2 Marks)

(c) For an AM Double-sideband full-carrier (DSB-FC) with a peak unmodulated carrier voltage, $V_c = 30V_p$ and a frequency of 200 kHz, a load resistor of 40Ω, frequency of modulating signal of 20 kHz and modulation index of 0.4, determine:

(i) The amount of carrier power, P_c. (2 Marks)

(ii) The amount of power using Double-sideband suppressed-carrier (DSB-SC). (2 Marks)

(iii) The amount of power using Single-sideband full-carrier (SSB-FC). (1 Mark)

(iv) The percentage of power saving of SSB-FC compares to DSB-FC. (2 Marks)