Student Name: ________________________________

Student ID: ________________________________
(Last 4 digits)

EE4330
Fundamentals of Telecommunication Systems
Instructor: Dr. K. R. Rao
Summer 2005, Test 2
Tuesday, 12 July 2005
4:00-5:00 PM

Instructions:

1. Closed books and closed notes

2. You can only use the four page cheat sheet handout

3. Choose best suitable answer from the options given and write down option (A, B, C or D) in the box provided.

4. Please print your name and last four digits of your student ID on first page of test booklet and any additional pages that you attach.

5. Show all your work and attach it to the test booklet.
(Q1) For envelop detection of VSB+C, the added carrier required is

A. larger than both AM and SSB+C.
B. larger than AM but smaller than SSB+C.
C. is smaller than AM but larger than SSB+C.
D. is smaller than both AM and SSB+C.

(Q2) A transmitter transmits an AM signal with carrier frequency 2000 kHz. When an inexpensive radio receiver (which has poor selectivity in RF stage bandpass filter) is tuned to 2000 kHz the signal is heard loud and clear. The same signal is also heard (not as strong) at another dial setting. What frequency will you hear the station if the IF frequency is 455kHz? (Note: Receiver frequency converter uses up-conversion)

A. 590 kHz
B. 1090 kHz
C. 1410 kHz
D. 2910 kHz

(Q3) Consider a super heterodyne receiver designed to receive the frequency band 20 to 50 MHz with IF frequency 10 MHz. What is the range of frequencies generated by local oscillator for this receiver? (Note: Receiver frequency converter uses up-conversion)

A. 30 to 60 MHz
B. 10 to 60 MHz
C. 10 to 40 MHz
D. 30 to 40 MHz
(Q4) Consider a super heterodyne receiver designed to receive the frequency band 1 to 30 MHz with IF frequency 10 MHz. Incoming signal with carrier frequency 10 MHz is received at 10 MHz setting. At this setting we also get interference from a signal with some other carrier frequency. If the receiver RF stage bandpass filter has poor selectivity what is the frequency of the interfering signal? (Note: Receiver frequency converter uses up-conversion)

A. 20 MHz
B. 30 MHz
C. 40 MHz
D. 50 MHz

(Q5) The carrier frequency of a certain VSB signal is \( f_c = 20 \) kHz and the baseband signal bandwidth is 6 kHz. The VSB shaping filter \( H_i \) is shown in the figure. Find the values of A and B in \( H_o \) (Note: Frequency axis is not to the scale).

A. 2 and 4 kHz.
B. 1 and 5 kHz.
C. 1 and 4 kHz.
D. 2 and 6 kHz.
(Q6) VSB modulation is used to modulate
A. Video spectrum of television signal.
B. Audio spectrum of television signal.
C. Video and audio spectrum of television signal.
D. None of the above.

(Q7) Power of frequency modulated signal
A. increases with increase in $k_f$.
B. decreases with increase in $k_f$.
C. does not depend of $k_f$.
D. None of the above.

(Q8) In PM, the instantaneous frequency $\omega_i$ of the signal varies linearly with
A. modulating signal.
B. derivative of the modulating signal.
C. integration of the modulating signal.
D. None of the above.

(Q9) Carrier acquisition in DSB-SC can be done with
A. signal squaring method
B. Costas loop
C. both A and B
D. None of the above.
(Q10) Carrier acquisition in VSB-SC can be done with
A. signal squaring method
B. Costas loop
C. both A and B
D. None of the above.

(Q11) FM signal with modulating signal $m(t)$ is NBFM when
A. $|k_f m(t)| = 1$
B. $|k_f m(t)| \ll 1$
C. $|k_f m(t)| \gg 1$
D. None of the above.

(Q12) If baseband signal has bandwidth of B then the corresponding NBFM signal has bandwidth of
A. $B/2$
B. $B$
C. $2B$
D. $4B$

(Q13) Over interval $|t| \leq 1$ and angle modulated signal is given by
$$\phi_{EM}(t) = 20\cos 15000t$$
It is known that carrier frequency $\omega_c=5000$. If this were PM signal with $k_p=1000$, $m(t)$ over interval $|t| \leq 1$ is given by
A. 5
B. 10
C. $5t$
D. $10t$
(Q14) For proper demodulation of PM, when modulating signal $m(t)$ has jump discontinuity, the phase variation $k_p m(t)$

A. must be restricted to $(-\pi/2, \pi/2)$.

B. must be restricted to $(-\pi, \pi)$.

C. must be restricted to $(-2\pi, 2\pi)$.

D. is not restricted.

(Q15) Output of the following modulating scheme is

A. VSB

B. DSB-SC

C. NBFM

D. NBPM