CS/B.Tech/EE/Even/Sem-6th/EE-605B/2015

WEST BENGAL UNIVERSITY OF TECHNOLOGY

EE-605B

COMMUNICATION ENGINEERING

Time Allotted: 3 Hours   Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as
practicable. All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer any *ten* questions. $10 \times 1 = 10$

(i) An FM wave is 100% modulated by a 10 kHz signal, the bandwidth required is

(A) 170 kHz   (B) 20 kHz   (C) 7.5 kHz   (D) 75 kHz

(ii) The modulation index of an FM signal is given by

(A) $\frac{\sigma}{f_m}$ (B) $\frac{f_m}{\sigma}$ (C) f_m (D) $\sigma.f_m$

(iii) The envelope detection is a/an

(A) synchronous detector   (B) asynchronous detector
(C) product modulator   (D) coherent detector

(iv) Pre-emphasis circuit is used

(A) after modulation   (B) before modulation
(C) before detection   (D) after detection

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(v) Indicate the false statement:

Modulation is used to

(A) separate differing transmission

(B) ensure that intelligence may be transmitted over a small distance

(C) increase the bandwith used

(D) allow the use of practicable antenna

(vi) Companding is used

(A) in PCM transmitter, to allow amplitudes limiting in the receivers

(B) to protect small signal in PCM

(C) none of these

(vii) In commercial FM broadcasting, the maximum frequency deviation is normally

(A) 5 kHz   (B) 15 kHz   (C) 75 kHz   (D) 180 kHz

(viii) PAM signal can be demodulated by

(A) a low-pass filter   (B) a band-pass filter
(C) a high-pass filter   (D) none of these

(ix) Which of the following system is analog?

(A) PPM   (B) PCM   (C) ASK   (D) BPSK

(x) The channel rejection in a superheterodyne receiver comes from

(A) IF stage only   (B) RF stage only
(C) Detector and IF stage only   (D) Detector, RF and IF stages

(xi) Thermal noise power in a resistor R is proportional to

(A) T (B) T^2 (C) $\frac{1}{T}$ (D) T^3

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. $3 \times 5 = 15$

2. Why is modulation required? If the modulation index of AM   1+2+2
is greater than unity, what problems will be encountered
during demodulation? Explain the principle of operation of
Rectifier Detector.

3. A 400 W carrier is amplitude modulated to a depth of 75%.   5
Calculate the total power in the modulated signal. Also
calculate the sides and power. Draw the power spectrum.

4. An amplitude modulated voltage is represented by the   1+1+1+2
expression $E = 5 [1 + 0.6 \cos (6280\ t)] \sin (2\pi \times 10^4 t)$ volts.
Find the modulation index, the peak instantaneous value of
the modulated wave, the rms voltage of the lower and upper
side frequencies. The modulated wave is applied across a
resistance of 1000 ohms. What is the power dissipated?

5. Explain frequency demodulation using balanced slope   5
detector.

6. (a) Explain with a block diagram the working of coherent binary   5
transmitter and receiver.
(b) What is the bandwidth of FSK signal?

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. $3 \times 15 = 45$

7. (a) How does noise appear in the communication system? Obtain   5+2+3+5
the signal-to-noise ratio at the output of a FM discriminator.
(b) Why is it required to employ pre-emphasis and de-emphasis
in the FM system?

(c) How can you calculate noise power of a particular
communication systems?

(d) A superhet receiver is designed to receive signals from
540-1600 kHz with fIF = 455 kHz. It is set to receive a
540 kHz signal. Assume that the LO has a significant third
harmonic out part. Find the possible carrier frequencies if
fLO = fC – fIF is used.

8. (a) State and prove the sampling theorem.   5+5+5
(b) Deduce the expression of quantization error of a PCM
mid-riser quantizer.
(c) Describe PAM, PWM, PPM for a communication system.

9. (a) Draw the block diagram for the generation of PCM signal.   4+2+6+3
(b) What is quantization error?
(c) With the help of block diagrams, explain working principle of
ASK modulator and demodulator.
(d) Draw ASK, FSK and BPSK signal to transmit data
stream – 10100011.

10. Compare AM and FM. What are NBFM and WBFM?   2+3+5+5
Compare PM and FM? Explain Armstrong's method for the
generation of FM.

11. Write short notes on any *three* of the following: 3×5
(a) Delta modulation
(b) FDM
(c) NBFM
(d) PWM
(e) Envelope detector.