CS/B.TECH (EE)/SEM-8/EC-802A/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (EE)/SEM-8/EC-802A/09

ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

COMMUNICATION ENGINEERING (SEMESTER - 8)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **marked** '**Answer Sheet**'.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

.....
Head-Examiner/Co-Ordinator/Scrutineer

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

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) σ / f_m b) f_m / σ

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. ☐

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. ☐

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vi) Companding is used

a) in PCM transmitter, to allow amplitudes limiting in the receivers

b) to protect small signal in PCM. ☐

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) Entropy is basically a measure of

a) rate of information b) average information

c) probability of information d) disorder of information. ☐

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

a) T b) T^2

c) $1/T$ d) T^3. ☐

xii) Principle of propagation of signal through optical fibre is

a) total internal reflection b) total internal refraction

c) total internal dispersion d) total internal polarization. ☐

xiii) 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. ☐

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xiv) Which of the following statement is true in case of satellite communication ?

a) uplink frequency is equal to the downlink frequency

b) uplink frequency is greater than the downlink frequency

c) uplink frequency is less than the downlink frequency

d) none of these.

xv) A linear code C of minimum distance d_{min} can correct upto t errors if

a) $d_{min} < t + 1$ b) $d_{min} \geq t + 1$

c) $d_{min} \leq t + 1$ d) $d_{min} = t + 1$.

GROUP – B

(Short Answer Type Questions)

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

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

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

4. Explain frequency demodulation using balanced slope detector. 5

5. a) Explain with a block diagram the working of coherent binary transmitter and receiver.

   b) What is the bandwidth of an FSK signal ? 5

6. a) Derive an expression for maximum channel capacity of a communication channel in the presence of Gaussian noise.

   b) A Gaussian channel has bandwidth of 100 kHz. If the signal power to noise power spectral density (S/N) is 10 ∧ 6 Hz. Find the channel capacity. 5

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GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. a) How does noise appear in the communication system ? Obtain 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. 5 + 2 + 3 + 5

8. a) State and prove the sampling theorem.

   b) Deduce the expression of quantization error of a PCM mid-riser quantizer.

   c) Describe PAM, PWM, PPM for a communication system. 5 + 5 + 5

9. a) Derive the signal to noise ratio at the output of the demodulator of a DSB-SC receiver.

   b) What is thermal noise ? Give the voltage generator and current generator equivalent circuit for thermal noise and find out RMS noise voltage and current respectively.

   c) Two resistors 30 k-ohm and 50 k-ohm are at room temperature 30 degree Celsius. For a BW of 2 MHz determine the thermal noise voltage of

      i) each resistor

      ii) two resistors in series and two resistors in parallel. 5 + 5 + 5

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10. a) Draw the block diagram for the generation of PCM signal.

b) What is quantisation 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.

4 + 2 + 6 + 3

11. Write short notes on any *three* of the following : 3 × 5

i) Delta modulation

ii) VSB modulation

iii) NBFM

iv) PWM

v) Envelope detector.

END

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