B. Tech.

(SEM. VI) EXAMINATION, 2006-07

COMMUNICATION ENGINEERING

Time : 3 Hours]   *[Total Marks : 100*

Note :   Attempt **all** questions, All questions carry **equal** marks.

1.   Attempt any **four** parts of the following.   5×4=20

   (a)   Evaluate the Fourier transform of the   5
         following signal

$$g(t) = \exp(-t)^* \sin(2\,\pi f_c t)$$

   where '*' denotes the convolution operator.

   (b)   Derive an expression for the effective   5
         modulation index of a multi-tone modulated
         AM signal.

   (c)   Describe briefly the operation of a Ring   5
         modulator used for the generation of DSB-SC
         signals.

   (d)   Describe briefly the operation of the   5
         superheterodyne receiver system.

(e) Consider the narrow-band FM signal   2+2+1
approximately defined by

$$s(t) = A_c \cos(2\pi f_c t) - \beta \sin(2\pi f_c t) \sin(2\pi f_m t)$$

Determine the envelope of this modulated signal. What is the ratio of the maximum to the minimum value of this envelope? Draw a phasor diagram to represent the above signal.

(f) Describe briefly the indirect method of   5
generation of FM signals.

2   Attempt any **four** parts of the following.   5×4=20

(a) What do you mean by the narrow-band noise?   5
Discuss briefly, the properties of the narrow-band noise.

(b) Describe briefly the functions of pre-emphasis   5
and de-emphasis filters in FM systems.

(c) State and explain the sampling theorem for   5
band-pass signals.

(d) Explain natural and flat-top sampling. Compare 5
the two.

(e) Describe briefly the Pulse Width Modulation   5
technique.

(f) Explain the methods for the demodulation of   5
PAM signals.

3   Attempt any **two** parts of the following.   2×10

(a) What is quantization noise in PCM systems?   2+3+5
How does it depend upon the step size? Suggest some methods to overcome the difficulties encountered when the modulating signal amplitude swing is large.

(b) Describe delta modulation systems. What 5+2+3
are its limitations? How can they be overcome?

(c) Describe briefly the different line codes used 10
for the electrical representation of the binary data
0 and 1.

4 Attempt any **two** parts of the following. 2×10

(a) What are TDM and FDM systems? Compare 10
the two and mention the application of each.

(b) Discuss briefly the operation of a 3+7
noncoherent FSK transmitter and receiver
systems. Also derive an expression for the
probability of error.

(c) Explain phase shift keying. Describe coherent 10
detection of PSK signals. Also derive an
expression for the probability of error.

5 Attempt any **two** parts of the following: 2×10

(a) What do you mean by the mutual 3+2+5
information of a communication channel? Define
the capacity of a discrete memoryless channel
in terms of mutual information. Derive an expres-
sion for the channel capacity of a discrete
memoryless binary symmetric channel.

(b) Consider a sequence of symbols emitted by 8+2
a source with their probabilities as given below:

Symbol	x1	x2	x3	x4	x5	x6	x7	x8
Probability	0.13	0.07	0.19	0.11	0.1	0.15	0.15	0.1

Compute the Huffman code for the above
source symbols. Also find the average code-
word length.

(c) Consider a sequence of symbols generated   **8+2**
by a source with their probabilities of occurrence
as given below:

Symbol	s1	s2	s3	s4	s5	s6	s7	s8	s9
Probability	0.22	0.19	0.15	0.12	0.08	0.06	0.06	0.07	0.05

Determine the code words of the symbols using
Shannon-Fano coding technique. Also deter-
mine the average code-word length.