



ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE - 2008
ANALOG COMMUNICATION
SEMESTER - 4

Time : 3 Hours]

[Full Marks : 70

GROUP - A**(Multiple Choice Type Questions)**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) If $X(\omega)$ is the Fourier transform of $x(t)$, then the Fourier transform of $x(t)e^{j\omega_0 t}$

a) $X(\omega - \omega_0)$

b) $X(\omega_0 - \omega)$

c) $X(\omega + \omega_0)$

d) $X(\omega_0)$ ☐

ii) For envelop detection in AM the value of RC should be

a) $1/W \ll RC \ll 1/f_c$

b) $1/W \gg RC \gg 1/f_c$

c) $1/W \ll 1/RC \ll 1/f_c$

d) $W \ll RC \ll f_c$ ☐

iii) The capacity C of AWGN channel is given by

a) $B \log_{10}(1+S/N) \text{ b/s}$

b) $B \log_2(1+S/N) \text{ b/s}$

c) $B \log_{10}(1+N/S) \text{ b/s}$

d) $B \log_2(1+N/S) \text{ b/s}$ ☐

iv) According to Carson's rule the bandwidth of FM signal is expressed as

a) $B = 2\Delta f + f_m$

b) $B = \Delta f + f_m$

c) $B = \Delta f + 2f_m$

d) $B = \Delta f + f_m/2$ ☐

v) Varactor diode is used for

a) FM generation

b) AM generation

c) PM generation

d) All of these. ☐**IV-245055 (3-A)**





xii) Flat-top sampling leads to

- a) an aperture effect b) aliasing effect
c) loss of signal d) none of these.



GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. A modulating signal given by $v_m = 2 \sin (2\pi \times 500 t)$ amplitude modulates a carrier given by $v_c = 10 \sin (2\pi \times 10^6 t)$. Determine

- i) modulation index
ii) frequencies present in the modulated signal
iii) total transmitter power.

2 + 1 + 2

3. a) State and prove Parseval's theorem.

1 + 2

b) Verify Parseval's theorem for the signal $g(t) = e^{-at}u(t); a > 0$.

2

4. Explain the working principle of PLL for FM demodulation.

5

5. a) What do you mean by distortionless transmission ?

2

b) Obtain the conditions for distortionless transmission of signals through a system.

3

6. a) Distinguish between 'auto-correlation' and 'cross-correlation' functions.

b) What is a 'balanced modulator' ? Explain the main advantages and disadvantages of such circuits.

5

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**GROUP - C****(Long Answer Type Questions)**Answer any *three* of the following questions. $3 \times 15 = 45$

7. a) Explain with suitable block diagram the generation of FM signal using Armstrong method. 5
- b) What is Narrowband FM and Wideband FM ? 2
- c) Explain with proper expression
- i) modulation index for FM
 - ii) bandwidth required for transmission of FM. 4
- d) The maximum deviation allowed in an FM broadcast system is 75 kHz. If the modulating signal is a single tone sinusoid of 10 kHz, find the bandwidth of the FM signal. What will be the change in the bandwidth, if the modulating frequency is doubled ? Determine the bandwidth when modulating signal amplitude is also doubled. 4
8. a) Define DSB-SC and SSB-SC. 4
- b) With neat block diagram explain the principle of SSB-SC generation by phase shift method. What is VSB-SC modulation ? 4 + 3
- c) Briefly explain QAM. 4
9. a) What do you mean by 'switching modulator' ? How can ring modulation be acted as switching modulator ? 5
- b) Show that an AM system using synchronous detection does not suffer from threshold effect. 5
- c) Compare FDM with a quadrature carrier multiplexing. 5

IV-245055 (3-A)



10. a) Discuss the methods for modulation and demodulation of PAM signal. 6
- b) Compare PAM with PWM system of signal/data transmission. 6
- c) Explain the terms 'sensitivity', 'selectivity' and 'fidelity' of a receiver. 3
11. a) In a multipath transmission system, the input and output are related by :
 $y(t) = x(t) + ax(t - \tau)$, where a and τ are constants. Determine the transfer function of the equalizer to compensate the channel induced distortion. 6
- b) Determine the performance of an FM system in the presence of additive Gaussian noise. Discuss briefly the improvement offered in noise performance by pre-emphasis and de-emphasis concepts. 9
12. Write short notes on any three of the following : 3 x 5
- i) Superheterodyne receiver
 - ii) Entropy
 - iii) Stereophonic FM broadcasting
 - iv) Source coding
 - v) Convolution theorem.

END