2007

ELECTRONICS

PAPER-XI

Full Marks . 75

Time : 3 hours

The figures in the *right-hand margin indicate full* marks.

Candidates are required to give *their* answers *in their own words* as *far as practicable.*

Illustrate the answers wherever necessary.

Write. the answers questions *of each Group in' separate* books.

Answer Q. *No. 1* and any *three* from the rest in each group.

Group - A

(Marks : 40)

(a) State the advantages and disadvantages of Digital Communication System.

(b) Compare between Digital and Analog Filters.

(c) What are the main advantages of the FIR Filter over IIR Filter?

(d) State whether PAM, PWM and PPM are analog or digital communication.

(e) Draw the block diagram for generation of PAM signal, 2x5

2. **Draw the block diagram of a Super-heterodyne receiver. Sate briefly how mixer and local oscillator assist in Super-heterodyning action.**

Indicate how much is the Intermediate frequency? **4+5+1**

3. (a) **Why S.S.B. is a better choice ? Draw a block diagram of S.S.B. generation.** **4+2**

(b) **The output voltage of a transmitter is given by - 500 (1 + 0.4 Sin1340t) Sin6.28 x 107t. The voltage is fed to a load of 600Q resistance.**

Determine,

(i)	**Carrier frequency.**	
(ii)	**Modulation frequency.**	
(iii)	**Carrier power.**	
(iv)	**Mean power output.**	**4**

4. (a) **Consider a DSB-Sc Signal corrupted by a additive white noise and demodulated by a synchronous detector having a phase error of 0. Find the output SNR.** **4**

(b) **What is Superheterodyne receiver ? Why is it so called ? Explain the principle of Superheterodyne receiver.** **1+1+4**

5. (a) **Explain with a suitable circuit diagram of FSK Generation.** **6**

(b) Determine (i) the peak frequency deviation, (ii) the minimum Band width and (iii) band for the FSK signal with a Mark frequency of 49 KHz, a space frequency of 51 KHz and input bit rate of 2K bps. 4

6. (a) State and explain Sampling theorem. 4

(b) What are the advantages and disadvantages of Delta modulation ? 3

(c) 24 telephone channels each band limited to 3.4 KHz are to, be Time Division Multiplexed by using PCM. Calculate the Band width of the PCM system for. 128 quantization levels and 8 KHz sampling frequency. 3

Group - B

(Marks : 35)

1. (a) What is total internal quantum efficiency of a Photo-diode ?

(b) What do you mean by an evanescent wave coupling?

(c) Why a fibre- bend causes a loss in energy of signal ?

(d) What is RZ coding in optical communication ?

(e) What do you mean by material and waveguide dispersion in single mode optical fibre communication. 1x5

2. (a) Discuss the principle of operation of a semiconductor laser diode.

(b) Obtain the **expression** of the light generated in the semiconductor laser cavity in respect of the applied current density to the laser. 5+5

3. **Discuss the principle of operation of a P–i-N Photo-detector and hence obtain the expression of photo-**current.

How does the photo-current depend on the width of the depletion layer of the detector? 4+5+1

4. **(a) Discuss, how can an isotropic non-linear material be** used as optical switch.

(b) Show, how such non-linear material can be used to develop any two logic gates. **5+(2 2 +22)**

5. **(a) Mention the various wavelengths chosen for propagating signal in multimode and singlemode fibres with their advantages in respect of loss and** dispersion.

(b) Show that the total broadening of light pulse . Ar due **to intermodal - dispersion . in a.multimode step** -index. fiber of length 'L is given by

$$\text{or} = L \frac{(NA)^2}{2n1C}$$

where the symbols have their usual meanings. 5+5

6. Write a short note (any *two)* 5x2

(i) WDM and DWDM.

(ii) Power budget equation.

(iii) Microbonding and Splice loss in optical fibres.

(iv) Responsivity of P-i-N photo-diode.