Total number of printed pages–4

3 (Sem–6/CBCS) PHY HE 1

2024

PHYSICS

(Honours Elective)

Paper : PHY–HE–6016

(Communication Electronics)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following : 1×7=7

   (i) What are the three main components of GPS navigation system ?

   (ii) What is signal-to-noise ratio ?

   (iii) Write the full form of GSM.

   (iv) Mention the basic principle used in Pulse-Amplitude Modulation (PAM)

   (v) What do you mean by 'sampling' in communication ?

(vi) Which type of pulse modulation is not binary ?

(vii) Mention the frequency range used in satellite communication.

2. Answer the following : 2×4=8

(i) Draw the block diagram of an electronic communication system.

(ii) Mention *two* important advantages of a superheterodyne receiver.

(iii) What is a geosynchronous orbit ? What is the value of the period of revolution of a satellite rotating in such an orbit ?

(iv) Explain the need for digital transmission.

3. Answer **any three** from the following : 5×3=15

(i) What do you mean by modulation index ? Calculate the ratio of the power associated with the sidebands to the total average power associated with the amplitude modulated wave. Find the value of the ratio if the modulation is 100%. 1+3+1=5

(ii) What is multiplexing ? Explain what you mean by Frequency Division Multiplex (FDM) and Time Division Multiplex (TDM).   1+2+2=5

(iii) Explain briefly the need for modulation in electronic communication.

(iv) State and explain sampling theorem, applicable to a pulse modulation system.   2+3=5

(v) Draw a simplified block diagram of mobile phone handset.

4. Answer **any three** from the following :
    10×3=30

(i) Derive the expression for an amplitude modulated (AM) wave.
The total power content of an AM wave is 1500 W. For a 100 percent modulation, determine

   (a) power transmitted by carrier

   (b) power transmitted by each sideband
    6+4=10

(ii) *(a)* What is the need for satellite communication ?

   (b) Mention *two* characteristics of geo-stationary satellites.

(c) Explain, in brief, how the geo-stationary satellites help in long distance communication.

(d) What are uplink and downlink ?

$$2+2+4+2=10$$

(iii) (a) Explain the basic concepts associated with ASK, FSK and PSK modulations.

(b) Draw the ASK and FSK modulated waves for an input binary sequence 1001011.

$$6+4=10$$

(iv) (a) Give a brief idea of GSM, CDMA, TDMA and FDMA technologies.

(b) What are SIM number and IMEI number ?

$$8+2=10$$

(v) (a) Explain the working of a super-heterodyne receiver with the help of a block diagram.

(b) Differentiate between PAM and PWM.

$$6+4=10$$

(vi) Write short notes on : $5+5=10$

(a) Pulse code modulation

(b) Electromagnetic communication spectrum

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