WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

PHSADSE06T-PHYSICS (DSE3/4)

COMMUNICATION ELECTRONICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.

Question No. 1 is compulsory and answer any *two* from the rest

1. Answer any ***ten*** questions from the following: 2×10 = 20

(a) Why modulation is necessary in electronic communication system?

(b) What do you mean by signal to noise ratio?

(c) Draw a simple block diagram of basic communication system and explain the function of channel.

(d) A carrier wave of 20-MHz is modulated by a 2-kHz audio sine wave. If the carrier voltage is 5 V and the maximum deviation is 10 kHz, write the equation of this modulated wave in the case of FM.

(e) Explain how FM can be converted to AM?

(f) Determine the maximum bit rate for an FSK signal with a mark frequency of 48 kHz, a space frequency of 52 kHz, and an available bandwidth of 10 kHz.

(g) In a noise-free binary coding system, calculate the channel capacity when the allowed bandwidth is 4 kHz.

(h) Why noise immunity of pulse width modulation (PWM) is better than that of pulse amplitude modulation (PAM)?

(i) Explain amplitude shift keying (ASK) with waveform diagram.

(j) Distinguish between SIM number and IMEI number in mobile communication systems.

(k) What are the frequency bands in India for the following mobile technology: (i) GSM (2G) (ii) CDMA (iii) 4G LTE (iv) WCDMA (3G).

(l) What are uplink and downlink frequencies in satellite communication?

(m) What is Curson's rule relating bandwidth of FM waves?

(n) In PWM, PPM, and PAM system, modulated signal consists of discrete pulses, but they are not digital modulation — Explain.

2. (a) Find out the frequency components present in an AM wave. Find out the bandwidth of an AM wave. 2+1

   (b) Explain the operation of an envelope diode detector for AM wave. What is Diagonal clipping? 3+1

   (c) Explain the basic principle of generation of PAM wave. 3

3. (a) A frequency modulation (FM) transmitter sends out a 100 MHz carrier wave frequency modulated by a 15 kHz sinusoidal audio signal. The maximum frequency deviation is 30 kHz. Find (i) the modulation index, (ii) channel width for three significant side frequency pairs. 2+1

   (b) Explain the concept of single side band (SSB) generation (by any method) in AM with a neat block diagram. 3

   (c) What is the difference between shift keying and modulation? 2

   (d) Calculate the height of the geosynchronous orbit from the mean sea level. 2

4. (a) Explain the need of super heterodyne receiver and give its block diagram. 1+2

   (b) Explain the terms sampling and quantization in pulse code modulation. 2+2

   (c) Show that, an increase in the number of bits in the code word by 1 enhances the output signal to noise ratio by 6 dB in pulse code modulation (PCM). 3

5. (a) If in a cellular network, signal to interference ratio (S/I) is 20 dB and path loss exponent (n) is 4, determine the co-channel reuse ratio (d/R) and minimum cluster size (N). 4

   (b) Draw a block diagram of mobile communication network and discuss briefly the role of each component. 3

   (c) What is angle of elevation in connection of satellite telecommunication and why it is kept larger than 5°? 2+1

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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