



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2022

**PHSADSE06T-PHYSICS (DSE3/4)**

**COMMUNICATION ELECTRONICS**

Time Allotted: 2 Hours

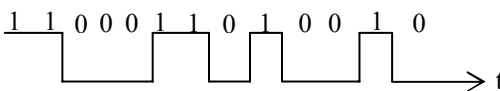
Full Marks: 40

*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
- Explain, what is channels and base band signals.
  - What is 'means and modes' in communication system?
  - An AM signal with a carrier of 1 kW has 200 Watts in each side band. What is the percentage of modulation?
  - What is overmodulation in AM? Draw the corresponding waveform for it.
  - A carrier wave of frequency 10 MHz and peak value 10V is amplitude modulated by a 5 kHz sine wave of amplitude 6V. Draw the frequency spectrum.
  - Write the uses of Pulse Amplitude Modulation (PAM).
  - State the sampling theorem and explain it briefly.
  - A digital communication link carries binary coded words representing samples of input signal  
$$x(t) = 3 \cos 600 \pi t + 2 \cos 1800 \pi t$$

What is the sampling frequency?
  - What are the advantages of digital communication over analog communication?
  - Why is the downlink frequency less than the uplink frequency?
  - Mention the advantages of geostationary satellites.
  - What is Time Division Multiplexing (TDM) in analog pulse modulation?
  - In cellular phone network, why the cells are taken as hexagonal in shape, instead of any other shapes?
  - What is the reason for using sim number in a mobile sim?
2. (a) Draw the diagram of amplitude modulated carrier wave for 100 percent modulation (modulation index  $m_a = 1$ ) and Zero percent modulation ( $m_a = 0$ ), respectively. 4

- (b) An AM broadcast transmitter radiates a power of 50 kW. If the modulation factor is 0.8, calculate the carrier power and power of side frequencies. 4
- (c) What are the advantages of SSB-SC transmission? 2
3. (a) Explain briefly the working principle of superheterodyne type of AM radio receiver. 2
- (b) Show that an amplifier having an input ( $v_i$ ) output ( $v_o$ ) characteristic given as  $v_o = a_1 v_i + a_2 v_i^2$  where ( $a_1$ ) and ( $a_2$ ) are constants, can be used to design an amplitude modulator. 3
- (c) What is the need of guard band in the frequency spectrum used in satellite communication? What is its typical value in a C-band communication satellite? 2
- (d) Draw a schematic circuit diagram of a resistance noise generator. An amplifier operating over the frequency range from 18 to 20 MHz has a  $10k \Omega$  input resistance. What is the rms noise voltage at the input to this amplifier if the ambient temperature is  $27^\circ\text{C}$ ? 1+2
4. (a) What do you mean by (i) look angle and (ii) geo-stationary satellite in case of satellite communication? 2+2
- (b) Explain the modulation technique for PAM. 4
- (c)  2
- The above is the Binary data sequence for a carrier signal. What is BPSK waveform?
5. (a) Show that for a hexagonal cell of arm-length  $R$  and diameter  $2R$ , the co-channel reuse ratio is proportional to  $7^{1/2}$  or  $\sqrt{7}$ , if the network system is 7 cell reuse system. 5
- (b) What is cell sectoring? Mention the advantages. 2+1
- (c) What is signal to interference ratio (SIR) and what is its implication in mobile network system? 2

**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.*

—x—