

B.Sc. 6th Semester (Honours) Internal Examination, 2019-20**PHYSICS****Course ID:****Course Code: SH/PHS/604/DSE/T8**

Course Title: Communication Electronics

Time: 1Hour 15 Minutes

Full Marks: 20

*The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
As far as practicable*

1. Answer any **five** questions: $1 \times 5 = 5$

- (i) In a communications system, noise is most likely to affect the signal
a. at the transmitter b. in the channel c. in the information source d. at the destination
- (ii) Indicate the true statement. Most receivers conforms to the
a. amplitude-modulated group b. frequency-modulated group c. superheterodyne group d. tuned radio frequency receiver group
- (iii) Which of the steps is not included in the process of reception?
a. decoding b. encoding c. storage d. interpretation
- (iv) The acoustic channel is used for which of the following?
a. UHF communications b. single-sideband communication c. television communications d. person-to-person voice communications
- (v) If the carrier of a 100 percent modulated AM wave is suppressed, the percentage power saving will be
a. 50 b. 150 c. 100 d. 66.66
- (vi) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
a. unchanged b. halved c. doubled d. increase by 50 percent
- (vii) A carrier is simultaneously modulated by two sine waves with modulation indices of 0.3 and 0.4; the total modulation index
a. is 1 b. cannot be calculated unless the phase relations are known c. is 0.5 d. is 0.7
- (viii) High-frequency waves are
a. absorbed by the F2 layer b. reflected by the D layer c. capable of use for long-distance communications on the moon
d. affected by the solar cycle
- (ix) Tropospheric scatter is used with frequencies in the following range:
a. HF b. VHF c. UHF d. VLF

2. Answer any **one** question: $5 \times 1 = 5$

- (a) Discuss (i) Skip distance (ii) MUF [5]
- (b) Show that if in AM modulation index increases from 0 to 1, total AM power will be increased by 50%. [5]
- (c) What do you mean by Modulation Efficiency? Find modulation efficiency of a 70.7% AM modulated wave. [5]
- (d) Discuss the advantages and drawbacks of AM. [5]
- (e) Show that for proper envelope detection for an AM Signal $s(t) = A_c \cos(2\pi f_c t) + 2 \cos(2\pi f_c t) \cos(2\pi f_m t)$ volt, the minimum value of carrier amplitude should be 2volt. [5]

3. Answer any **one** question: $10 \times 1 = 10$

- (a) (i) Provide a block diagram of a radio telephone transmitting system and mention the significance of each stage.
(ii) Discuss different modes of radio wave communication. [6+4]
- (b) (i) Why there is a need for modulation?
(ii) In Channel Band Width and Signal Band Width which should be preferably greater?
(iii) Find Fourier transform of $A \cos(2\pi f_0 t)$ and express it in frequency domain.
(iv) What do you mean by Base Band Signal and Band Pass signal? [2+2+3+3]
- (c) A carrier of $10 \cos(2\pi \times 10^6 t)$ volt is amplitude modulated by a message signal of $4 \cos(4\pi \times 10^3 t)$ volt with 50% of modulation. Antenna resistance is 5 ohm. Identify and find:
(i) All the parameters (A_m, f_m, A_c, f_c , Band Width, $\mu, P_c, P_{SB}, P_{LSB}, P_{USB}, P_T, \eta$)
(ii) Plot AM Spectrum and identify the spectral components. [10]