

B.Sc. 6th Semester (Honours) Examinations, 2020**PHYSICS****(Communication Electronics)****Paper: 604/DSE-4/T-8****Course ID: 62417****Time: 1 Hour****Full Marks: 12**

*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 two* questions of the following: 1×2=2
 - (a) In which case, noise is most likely to affect the signal - Transmitter, Channel & Receiver?
 - (b) Most receivers conform to the super-heterodyne group -- Justify.
 - (c) If the modulation index of an AM wave is changed from 0 to 1, the transmitted power will be increased by $x\%$. Find the value of x .
 - (d) A carrier is simultaneously modulated by two sine waves with modulation indices of 0.3 and 0.4. Find the effective modulation index.
 - (e) Calculate the Power-SNR (dB) for a noise level of $1\mu\text{V}$ in a signal of 200mV .
 - (f) Mention the frequency bands used in mobile communication.

2. Answer *any one* of the following: 4×1=4
 - (a) What do you mean by modulation efficiency in AM? Find out modulation efficiency of a 70.7 % AM-modulated wave. Provide a block diagram. 1+2+1=4
 - (b) The equation of a carrier signal is given by $e_c = E_C \sin(\omega_c t + \phi)$ and that of the modulating signal $e_m = E_m \cos \omega_m t$. Derive an equation for the modulated signal and modulation index for amplitude modulation. What do you mean by upper and lower side frequency? 3+1=4
 - (c) What do you mean by numerical aperture? Find an expression for numerical aperture of a step-index fibre. Discuss the advantage of graded-index fibre over step-index fibre. 1+2+1=4

3. Answer *any one* of the following: 6×1=6
 - (a) Provide a block diagram of a radio telephone transmitting system and mention the significance of each stage. Discuss the working of a superheterodyne receiver with proper block diagram. 3+3=6

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- (b) 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.

Find/Identify/Determine the following:

- | | |
|---|---|
| i. Band Width, | 1 |
| ii. Modulation index, | 1 |
| iii. Power carried by carrier, | 1 |
| iv. Total power contained in side bands, | 1 |
| v. Power contained in upper side band, | 1 |
| vi. Total power transmitted by the Antenna, | 1 |

- (c) Mention the name of a few types of communication satellites. What is a transponder in a satellite and why it is used? What is the difference between geo-synchronous and geo-stationary orbits? What are uplink and downlink frequencies? Give with proper labelling the block diagram of an earth station.

$$1+2+1+1+1=6$$
