

**B.Sc. 5th Semester (Honours) Examination, 2022 (CBCS)****Subject : Physics****Course : DSE-2(4)****(Communication System)****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words  
as far as practicable.**Symbols and abbreviations have their usual meanings.*

1. Answer *any five* of the following questions: 2×5=10
- (a) What is the function of a carrier in a modulation system?
  - (b) What are the differences between DSB–SC and SSB–TC amplitude modulated signal?
  - (c) Write the advantages and disadvantages of digital communication.
  - (d) What is aliasing?
  - (e) What is thermal noise?
  - (f) What are the services offered by GSM?
  - (g) What is Shannon limit for information capacity?
  - (h) What is meant by figure of merit of a receiver?
2. Answer *any two* of the following questions: 5×2=10
- (a) What do you mean by demodulation or detection?  
A diode envelope detector uses a parallel RC network with  $R = 220\text{k}\Omega$  and  $C = 200\text{pF}$ . If an AM wave with 40% modulation is fed to this detector, what is the highest modulation frequency that can be detected with tolerable distortion? 2+3=5
  - (b) An FM transmitter sends out a 100MHz carrier wave frequency modulated by a 15kHz sinusoidal audio signal. The maximum frequency deviation is 30kHz. Find the modulation index, three pairs of side-frequencies and the bandwidth required for these side-frequency pairs. 2+2+1=5
  - (c) Explain the terms sampling and quantizing in pulse code modulation. Derive an expression for linear quantization error. 1+1+3=5
  - (d) Explain the operation of cellular telephone network. Why is hexagonal shape preferred for cell site? 4+1=5

3. Answer *any two* of the following questions:

10×2=20

(a) Using Kepler's law, estimate the orbital velocity of a Geosynchronous satellite and hence estimate round trip propagation delay between a satellite and an earth station located just below it. What are the advantages and disadvantages of Geosynchronous satellites?

4+3+3=10

(b) Draw a block diagram of mobile communication network system and explain its operation in brief. What do you mean by 2G, 3G and 4G technologies? Describe the technological implementation of each type of mobile phone system.

5+2+3=10

(c) Define the following terms for FSK modulation:

Frequency deviation, Modulation index Deviation ratios.

What is binary phase shift keying? FSK and PSK signals preferred over ASK signals.

—Why?

2+2+2+2+2=10

(d) How are the shortcomings of a straight forward AM radio receiver eliminated in superheterodyne radio receiver? Explain the structure and operation of a superheterodyne receiver with basic block diagram.

2+8=10