

P.G. Semester-IV Examination, 2023**PHYSICS****Course ID : 42455 Course Code : PHYS-405ME(A)****Course Title : Advanced Electronics-III**

Time : 2 Hours

Full Marks : 40

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any **five** of the following questions :

2×5=10

- a) What do you mean by random process? Explain.
- b) What, are autocorrelation function and autocovariance function? When they become equal?
- c) Write a short note about frequency translation of a signal [say $g(t)$].
- d) What is Modulation Index in case of Amplitude Modulation? In this context, state the disadvantage of over-modulation. 1+1
- e) In the field of Digital Modulation techniques, can you highlight the difference between PSK and FSK only with the help of signal spectrums? (No calculations are required.)

[Turn over]

- f) Briefly explain what is AWGN in the context of signal transmission by noise? What is the unit of SNR? 1+1
- g) What do you mean by AMPS, GSM and CDMA?
- h) What is QPSK? Explain.

2. Answer any **four** of the following questions :

5×4=20

- a) Prove that $0 \leq H(x) \leq \log_2 M$, where $H(x)$ is the entropy and M is total number of events. 5
- b) Describe the QAM technique in case of Amplitude Modulation. State one advantage and one disadvantage of the above method. 3+2=5
- c) What is power spectral density? State and explain Weiner-Kheinchin theorem. 1+4=5
- d) Explain PPM and PWM in case of Pulse Modulation. 5
- e) State and explain channel capacity theorem. 5
- f) Write a short note on FM and PM. How are they connected to each other? (Abbreviations have their usual meanings.) 2+2+1=5

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

10×1=10

- a) i) Explain the modulation and demodulation techniques of a message signal $m(t)$ in case of DSB-SC Modulation.
- ii) Draw the frequency spectrum of the modulated signal if $m(t)=\cos(\omega_m t)$, ω_m being the frequency of the modulating signal. (3+3)+4=10
- b) Write short notes on (any **two**): 5+5=10
 - i) Cellular Concept of mobile communication
 - ii) Pulse RADAR
 - iii) Properties of autocorrelation function