

M.Sc. 4th Semester Examination, 2022

PHYSICS

(Advanced Electronics-III)

Paper: 405ME(A)

Course ID: 42455

Time: 2Hr

Full Marks: 40

*Candidates are required to give their answers in their own words
as far as practicable.*

The questions are of values indicated in the margin.

- 1. Answer any five of the following questions** **2×5=10**
- (a) Write the mathematical expression of a periodic pulse with time period T_0 and pulse strength I .
 - (b) State sampling theorem.
 - (c) What is the advantage of VSB over SSB?
 - (d) What is the difference between natural sampling and flat-top sampling?
 - (e) What is QPSK? Explain.
 - (f) Define the terms 'Entropy' and 'Information Rate' in the context of information theory.
 - (g) What do you mean by 'Random Process' in the context of information theory? Explain.
 - (h) State Nyquist theorem.
- 2. Answer any four of the following questions** **5×4=20**
- (a) What is PCM? Draw the block diagram of a PCM system stating the use of its components. 1+2+2=5
 - (b) What is 'strict sense stationary process'? Explain. What is 'Auto-correlation function'? Explain. 2.5+2.5=5
 - (c) Consider a random process $X(t)$ given by

$$X(t) = A \cos(\omega t + \Theta(t)),$$

where A and ω are constants and Θ is a uniform random variable over $-\pi$ to $+\pi$. Show that, $X(t)$ is a wide sense stationary process.

Θ being a uniform random variable, such that

$$f_{\Theta}(\theta) = \begin{cases} \frac{1}{2\pi} & \text{for } -\pi \leq \theta \leq \pi, \\ 0 & \text{for } \textit{Otherwise}. \end{cases}$$

- (d) Consider a random process given by $X:N(\mu;\sigma^2)$. Find the function of random process given by $Y=aX+b$, where a and b are constants.
- (e) State and explain Shanon-Hartley theorem.
- (f) What is BPSK? State how BPSK signal can be generated. 1+4=5

3. **Answer any one of the following questions:** **10×1=10**

(a) Write short notes on *any two* of the following: 5+5=10

- i. Radar range equation,
- ii. Shanon-Fano algorithm,
- iii. GSM mobile communication.

(b) Define DPSK. Explain the principle of recovering the base band signal in DPSK with it's block diagram. 2+5+3=10
