

Reg. No

Name

M. Sc DEGREE END SEMESTER EXAMINATION - OCTOBER 2019**SEMESTER 3 : PHYSICS****COURSE : 16P3PHYT12EL : INTEGRATED ELECTRONICS AND DIGITAL SIGNAL PROCESSING***(For Regular - 2018 Admission and Supplementary - 2016/2017 Admissions)*

Time : Three Hours

Max. Marks: 75

Section A**Answer all Questions (1 marks each)**

1. Typical doping density of Tunnel contacts,
a) 10^{19} cm^{-3} b) 10^9 cm^{-3} c) 10^{10} cm^{-3} d) 10^{14} cm^{-3}
2. A band pass signal extends from 1 kHz to 2 kHz. The minimum sampling frequency needed to retain all information in the sampled signal is
a) 1kHz b) 2 kHz c) 3 kHz d) 4 kHz
3. Value of $\sum \delta(n)e^{6n}$ (with limit $n = 0$ to ∞) is
a) 0 b) 1 c) 6 d) ∞
4. The number of complex addition required for direct evaluation of one value of $X(k)$
a) $4N-2$ b) $N-1$ c) $4(N-1)$ d) $N(N-1)$
5. For radix -2 FFT, N must be a power of
a) N b) 4 c) 2 d) $N/2$

(1 x 5 = 5)

Section B**Answer any 7 (2 marks each)**

6. What is integrated resistor ?
7. What is the difference between MSI and LSI?
8. Define *sheet resistance* R_s . What is the order of magnitude of R_s for the base region and also for the emitter region.
9. Write a short note on insulators in IC.
10. Describe two applications of DSP?
11. Write a short note on correlation of two sequences.
12. Define the term 'linearity'. Illustrate with one example.
13. Illustrate the properties of causality and time-variance with suitable examples.
14. Define:
a) CTFT
b) DTFT
15. What do you mean by transformation?

(2 x 7 = 14)

Section C**Answer any 4 (5 marks each)**

16. Sketch the cross section of a diode pair using collector-base regions if:
a) The cathode is common and b) The anode is common.
17. Find the even and odd parts of the signal $x(n) = (\sin \pi n + 1)^2$

18. Why FIR systems are non recursive? Obtain the frequency impulse response of an FIR system.
19. What is twiddle factor? State and establish the symmetry and periodic property exhibited by twiddle factor.
20. What is FFT? Describe the amount of reduction in computation on using FFT to compute DFT?
21. Find the direct and inverse coefficients of discrete time Fourier series.

(5 x 4 = 20)

Section D**Answer any 3 (12 marks each)**

- 22.1. Discuss the various steps involved in the fabrication of an npn transistor in VLSI technology?

OR

2. Discuss the following in connection with IC fabrication:-
a) Etching b) semiconductor contact c) inductors in IC d) integrated diode structures.

- 23.1. Establish the properties of Cross correlation and Auto correlation sequences.

OR

2. Determine if the system described by the following input –output equations is linear or nonlinear.

a) $y(n) = x(n) + 1/\{x(n-1)\}$

b) $y(n) = x^2(n)$

c) $y(n) = n x(n)$.

d) $y(n) = 2x(n) + 1/\{x(n-1)\}$.

- 24.1. Explain any five properties of Discrete Fourier Transform. Describe with examples. Also find the DTFT of the following sequences:

a) $x(n) = (1/2)^n u(-n)$ b) $x(n) = \delta(n) - \delta(n - 1)$.

OR

2. Define Z-transform. Explain poles, zeroes and ROC. Also discuss the properties of Z-transform. Explain decimation in frequency Fast Fourier Transform algorithm.

(12 x 3 = 36)