

TM153535B

Reg. No:.....

Name:.....

M. Sc. DEGREE (C.S.S.) EXAMINATION, APRIL 2017

(Supplementary – 2015 Admission)

SEMESTER III – PHYSICS

PH3EA1TM – OPTOELECTRONICS AND DIGITAL SIGNAL PROCESSING

Time: Three Hours

Maximum Marks: 75

PART A

I. Answer any five questions. Each question carries 3 marks

1. Why GaAs is preferred as LED material over Si?
2. Explain the working of phototransistor.
3. Distinguish between Pockel effect and Kerr effect.
4. Briefly explain what is meant by optical bistability.
5. Distinguish between homogeneous and inhomogeneous broadening.
6. Explain line shape function and its importance.
7. Explain periodic and aperiodic signals. Give examples.

(5x3=15)

PART B

II. Answer any six questions. Each question carries 5 marks.

8. Explain internal and external quantum efficiency with regard to LED. Outline the parameters affecting the quantum efficiency.
9. Explain the photovoltaic and photoconductive modes of operation of photodiode.
10. Explain the construction and working of double heterojunction LED.
11. Explain the working of an acousto-optic modulator.
12. Explain the principle of second harmonic generation.
13. Obtain Einstein relations and discuss the need for population inversion for laser action.
14. Describe the principle of Q-switching.
15. Define odd signal and even signal with examples. Find the even and odd components of the signal $x(t) = \cos t + \sin t + \cos t \sin t$
16. What is the condition for the existence of DTFT. Find the discrete time Fourier transform of $x(n) = \{1, -1, 2, 2\}$

(6 x 5 = 30)

PART C

III. Answer any two questions. Each question carries 15 marks

17. Explain the principle of solar cell. Draw the equivalent circuit of a solar cell and carry out the analysis of the cell based on it and highlight the effect of series and shunt resistances.
18. What is meant by optical nonlinearity. Explain the following: (i) second harmonic generation, (ii) Optical parametric oscillation.
19. Describe the amplification of light in a gain medium and derive the equation for gain coefficient.
20. What is meant by filtering in DSP? Discuss different types of linear FIR filters.

(2 x 15 = 30)