B. Sc. (Sem. IV) (CBCS) Examination

March / April - 2018

Physics - 401

(Old Course)

Faculty Code : 003
Subject Code : 001402

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) Symbols have their usual meanings.

(3) Figures to the right indicate marks.

1 Answer the following in short :   **20**

(1) Define diffraction.

(2) Give equation for the focal length of zone plate.

(3) Give the full form of LASER.

(4) List the three main properties of LASER.

(5) What is the proportion of gases mixture in He-Ne laser?

(6) Name the types of optical fibres.

(7) The measure of light that can be collected by optical fiber is given by its........

(8) Give the equation for Barkhausen criterion.

(9) In a Hartley oscillator the operating frequency f_0 = _____.

(10) In a Colpitt's oscillator, the feedback fraction is given by the equation m_v = _____.

(11) The process of recovering the audio signal from the modulated wave is known as _____.

(12) In a superheterodyne receiver the intermediate frequency used is _____.

(13) What is the frequency range of audio waves?

(14) Define pinch off voltage for a JFET.

(15) A JFET is a _____ controlled device.

(16) What is the full form of MOSFET?

(17) In Boolean Algebra, the plus sign (+) indicates which operation?

(18) A circuit which converts binary to decimal is called _____.

(19) Give the full form of LASCR.

(20) What does LCD stand for?

2   (a)   Answer the following questions : (any **three**)   6

(1)   Find the radii of first three transparent zones of a zone plate whose first focal length is $2\,m$ for $\lambda = 6000\,\overset{\circ}{A}$.

(2)   Give the method of constructing a zone plate.

(3)   Give the characteristic of spontaneous emission.

(4)   Give the applications of LASERs.

(5)   What is meant by modes? Define single and multimode fibers.

(6)   What is feedback? Give its types.

(b)   Answer the following questions : (any **three**)   9

(1)   Give the comparison of performance of Zone plate and convex lens.

(2)   Differentiate between the Prism Spectra and Grating Spectra.

(3)   Explain Population Inversion.

(4)   Explain Metastable States.

(5)   Explain critical angle and acceptance angle in short.

(6)   Draw the circuit diagrams of RC, LC and Colpitt oscillator with label.

(c) Answer the following questions : (any **two**) 10

(1) Explain the meaning of Fresnel's half period zones. Show that (i) The radii of zones are proportional to $\sqrt{n}$, where $n = 1$, 2, 3 etc., and (ii) the areas of various half period zones are independent of the order of the zones n.

(2) Explain with neat diagram absorption, spontaneous emission and stimulated emission of radiation.

(3) Explain the construction and working of He-Ne laser.

(4) What is acceptance angle for an optical fiber? Derive its expression.

(5) Explain the Barkhausan criterion of sustained oscillation by positive feedback.

3 (a) Answer the following questions : (any **three**) 6

(1) Give the names of essential parts of Radio broadcasting.

(2) Give the advantages of Frequency Modulation.

(3) Draw diagrams and schematic symbol of p-channel and n-channel JFETs

(4) Write any three differences between JFET and BJT.

(5) Convert below given number into binary : $(12.23)_{10}$, $(123.125)_{10}$, $(87)_{10}$, $(68.6125)_{10}$

(6) Write the applications of Phototransistors.

(b) Answer the following questions : (any three) 9

(1) Explain Straight Radio Receiver with circuit diagram.

(2) Define JFET parameters and establish the relation between them.

(3) Describe the different methods of biasing of JFET

(4) Explain the working of NOT gate from NAND gate.

(5) State and explain Commutative Law using Logic gates.

(6) Describe the construction, working and characteristics of LDR.

(c) Answer the following questions : (any two)　　　　　**10**

(1) Explain in detail Superheterodyne Receiver with circuit diagram.

(2) Describe construction and working of MOSFET.

(3) Explain in detail NAND and NOR gates with circuit diagram.

(4) State and prove De Morgan's Theorems with circuit diagram.

(5) Explain Light Activated Relay as (i) Temperature Control Circuit (ii) Twilight Switch.

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