AAP-003-001402 Seat No. _____

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

April / May - 2016

Physics : P - 401

(Optics, Laser & Electronics) (New Course)

Faculty Code : 003

Subject Code : 001402

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

Instructions : (1) Write answer of all questions in main answer book.
(2) All questions are compulsory.
(3) Figures on right side indicates full marks.
(4) Symbols have their usual meanings.

SECTION — A

1 Select the correct option from the following M.C.Qs. : **20**

(1) The area of each half period zone is equal to _____.

(A) $\pi\lambda$ (B) $\pi b\lambda$

(C) $\pi\lambda/b$ (D) $\pi b/\lambda$

(2) The image is formed by _____ in a Zonal plate.

(A) diffraction (B) polarization

(C) interference (D) none of the above

(3) Condition for popular inversion is _____

(A) $N_1 > N_2$ (B) $N_1 = N_2$

(C) $N_1 <<< N_2$ (D) none of the above

(4) Ruby Laser has a set of _____ energy levels.

(A) 2 (B) 4

(C) 1 (D) 3

(5) In He – Ne Laser, the ratio of mixture of He and Ne is _____

(A) 10 : 1 (B) 1 : 10

(C) 1 : 2 (D) 2 : 1

(6) An optical fiber works on the principle of _____
(A) total internal reflection
(B) diffraction of light
(C) interference of light
(D) superposition theorem

(7) Total angle of the acceptance cone is _____ acceptance angle.
(A) twice the (B) half of
(C) same as (D) none of the above

(8) The fiber materials are _____ materials.
(A) conducting (B) insulator
(C) semiconductor (D) superconductor

(9) An oscillator converts _____ power into _____ power.
(A) a. c., d. c.
(B) d. c., a. c.
(C) electrical, mechanical
(D) mechanical, electrical

(10) An oscillator produces _____ oscillations.
(A) damped (B) undamped
(C) modulated (D) none of the above

(11) A phase shift oscillator uses identical sections. The value of components are $R = 100\,k\Omega$ and $C = 0.01\mu F$. The frequency of oscillation is approximately _____ Hz.
(A) 71 (B) 75
(C) 61 (D) 65

(12) In India, _____ modulation is used for radio communication.
(A) phase and amplitude (B) frequency
(C) phase (D) amplitude

(13) In TV transmission, picture signal is _____ modulated.
(A) phase and amplitude (B) frequency
(C) phase (D) amplitude

(14) The radio waves are _____ waves.
(A) electrical (B) magnetic
(C) electromagnetic (D) ultrasonic

(15) A JFET is a _____ driven device.
(A) both voltage and current
(B) current
(C) voltage
(D) none of the above

(16) A JFET has _____ power gain.

(A) small (B) very small

(C) very high (D) none of the above

(17) A UJT is _____ power absorbing device under normal operating conditions.

(A) low (B) high

(C) negative (D) infinite

(18) In Boolean algebra, the + sign indicates _____ operation.

(A) AND (B) OR

(C) NOT (D) NAND

(19) The universal gate is _____

(A) AND (B) OR

(C) NOR (D) NOT

(20) The highest conversion efficiency of silicon solar cell is _____ %.

(A) 6 (B) 50

(C) 80 (D) 22

SECTION - B

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

(1) Explain Fraunhoffer diffraction.

(2) What is Laser? Write its applications.

(3) What do you mean by spontaneous emission?

(4) Defining optical fiber, write its principle.

(5) Derive the relation between numerical aperture and fractional refractive index change.

(6) Write advantages of Sinusoidal Oscillator.

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

(1) Write comparison between Zone plate and convex lens (any six).

(2) Explain stimulated emission.

(3) Describe population inversion.

(4) Derive an equation of critical propagation angle for optical fiber.

(5) Explain the action of Hartley Oscillator.

(6) Explain the principle of Phase Shift Oscillator.

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

(1) Derive an expression for angular separation between any two consecutive minima or maxima.

(2) Write a note on Ruby Laser.

(3) Define and derive an equation of acceptance angle with appropriate figure.

(4) Explaining the action of Colpit's Oscillator, define feedback fraction.

(5) Explaining the action of Wien Bridge Oscillator, write its advantages.

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

(1) Write advantages of frequency modulation over amplitude modulation.

(2) Write limitations of straight radio receiver.

(3) Write differences between JFET and bipolar transistor (any four).

(4) Write advantages of JFET (any four).

(5) Write differences between analog signal and digital signal.

(6) Write a note on Photo Transistor.

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

(1) Write a note on Amplitude Modulation.

(2) Explain the working of transistor as Amplitude Modulator.

(3) Explain the principle of JFET.

(4) Write definition of parameters of JFET.

(5) Explain OR gate.

(6) Write a note on LDR.

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

(1) Explain the general principle of radio broadcasting, transmission and receiver.

(2) Explain output characteristics of JFET with necessary circuit diagram.

(3) Drawing the equivalent circuit of UJT, discuss its working.

(4) Explain NAND gate as a universal gate.

(5) Defining Solar Cell, discuss its construction and working.