

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

- Q.1(A) Answer the following questions (any one). [7]
- (1) Defining internal energy and specific heats of a gas, explain first law of thermodynamics.
 - (2) What is Joule – Thomson expansion? Explain Porous plug experiment.
- Q.1(B) Answer the following questions (any one). [4]
- (1) What is thermodynamics system? Write type of system with example.
 - (2) Derive Mayer's formula.
- Q.1(C) Answer the following questions (any three). [3]
- (1) Internal energy of an ideal gas depends upon _____.
 - (2) The first law of thermodynamics is the law of conservation of _____.
 - (3) Joule's mechanical equivalent of heat $J =$ _____ Joule/cal.
 - (4) The unit of specific heat in C.G.S. system is _____.
 - (5) The efficiency of a Carnot's engine working between 27°C and 327°C is _____.
- Q.2(A) Answer the following questions (any one). [7]
- (1) Describe entropy of a perfect gas. Obtain change in entropy in terms of (i) T and V, (ii) T and P and (iii) P and V.
 - (2) Explain Wien's displacement law and Rayleigh – Jean's law. Derive Wien's law and Rayleigh - Jean's law in relation to Planck's law.
- Q.2(B) Answer the following questions (any one). [4]
- (1) Write a note on temperature entropy diagram.
 - (2) State and explain Stefan – Boltzmann's law.
- Q.2(C) Answer the following questions (any three). [3]
- (1) During an adiabatic process, the change of entropy is _____.
 - (2) All natural processes taking place in the universe are _____.
 - (3) The entropy of a substance in gaseous state is _____ that in the liquid state.
 - (4) What is the value of Wien's displacement constant in $\text{cm}\cdot\text{k}$?
 - (5) Wien's law for black body radiation holds for _____ wavelengths.
- Q.3(A) Answer the following questions (any one). [7]
- (1) Deriving general expression of Maxwell's thermodynamic relation, derive four fundamental thermodynamic relations from it.
 - (2) Explaining Joule – Thomson effect, define Joule – Thomson coefficient.
- Q.3(B) Answer the following questions (any one). [4]
- (1) Derive Clausius – Clapeyron's latent heat equation.
 - (2) Derive Tds equations.
- Q.3(C) Answer the following questions (any three). [3]
- (1) Helmholtz free energy $F =$ _____.
 - (2) Write relation between Gibb's function and Helmholtz free energy.
 - (3) Relation between Gibb's function and Enthalpy is _____.
 - (4) For reversible isobaric process, the change in Enthalpy is equal to _____.
 - (5) For n mole perfect gas, the equation of state is _____.

Q.4(A) Answer the following questions (any one). [7]
(1) Explaining principle, construction and working of photo diode, write its applications.
(2) Explaining output characteristics of JFET, write only definition of its parameters.

Q.4(B) Answer the following questions (any one). [4]
(1) Drawing emitter characteristic of UJT, explain it.
(2) Explain NAND gate as universal gate.

Q.4(C) Answer the following questions (any three). [3]
(1) When reverse voltage of varactor diode is increased, its junction capacitance _____.
(2) The highest conversion efficiency of Si Solar cell is _____.
(3) JFET has _____ input impedance.
(4) UJT is _____ power absorbing device under normal operating conditions.
(5) The binary system has a base of _____.

Q.5(A) Answer the following questions (any one). [7]
(1) Derive an expression of current for L-C-R parallel a.c. circuit at resonance and explain Q factor.
(2) Explaining action of Wien bridge oscillator, write its advantages and disadvantages.

Q.5(B) Answer the following questions (any one). [4]
(1) Derive a.c. bridge balance condition.
(2) Calculate frequency of oscillations for Colpitt's oscillator if $L = 0.5$ millihenry, $C_1 = 2$ PF and $C_2 = 3$ PF.

Q.5(C) Answer the following questions (any three). [3]
(1) The condition $X_L = X_C$ is known as _____ condition.
(2) L-C-R series a.c. circuit is called _____ circuit.
(3) _____ bridge is used for comparing two capacitors.
(4) Write unit of specific resistance.
(5) In Hartley oscillator, feedback fraction $K_v =$ _____.

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BSc4PhyC0401
B.Sc. Semester - 4 (CBCS) Examination
March/April- 2019
PHYSICS
(CORE)

Seat No: _____

Time: 2:30 Hours

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Marks: 70

Q.1 (A) Answer any one question.

- (1) Defining specific heats of gas, derive Mayer's formula. [7]
- (2) Explaining heat engine, derive formula for efficiency of heat engine. Explain Carnot's ideal heat engine.

Q.1 (B) Answer any one question.

- (1) Derive the formula of work done during an adiabatic process. [4]
- (2) Explain Porous plug experiment with experimental setup and working.

Q.1 (C) Answer any three questions.

- (1) The value of Joule's mechanical equivalent of heat is $J = \text{_____}$ Joule/cal. [3]
- (2) What is isobaric process?
- (3) In an adiabatic process, pressure (P) and volume (V) are related by _____.
- (4) At sufficient low temperatures, all gases show a _____ effect.
- (5) The efficiency of a Carnot's engine working between 77°C and 427°C is _____.

Q.2 (A) Answer any one question.

- (1) Explaining entropy of a perfect gas, obtain change in entropy in terms of (i) T and V (ii) T and P (iii) P and V. [7]
- (2) Explain distribution of energy in black body spectrum and discuss its results.

Q.2 (B) Answer any one question.

- (1) Explain change in entropy in reversible process. [4]
- (2) Define Stefan - Boltzmann law.

Q.2 (C) Answer any three questions.

- (1) The entropy of the universe _____. [3]
- (2) The efficiency of heat engine is less than one. Agreed?
- (3) In Wien's law of energy distribution, E_m is proportional to _____.
- (4) Rayleigh - Jeans law holds good for _____ wavelengths.
- (5) On the basis of quantum theory, _____ derive the formula of distribution of energy with wavelength.

Q.3 (A) Answer any one question.

- (1) Explain following thermodynamic potentials and define their relations with thermodynamic variables: (i) Enthalpy H and (ii) Gibbs function G. [7]
- (2) Discuss following applications of Maxwell's thermodynamic relations:
 - (i) Clausius - Clapeyron's latent heat equation.
 - (ii) Specific heat equation ($C_p - C_v = R$).

Q.3 (B) Answer any one question.

- (1) Explain internal energy of the system in terms of thermodynamic variables. [4]
- (2) Write a note on Helmholtz free energy (F).

Q.3 (C) Answer any three questions.

- (1) Enthalpy is the total heat of the system. Agreed?
- (2) In an isothermal isobaric process, Gibbs free energy (G) _____.
- (3) _____ is called first thermodynamic potential.
- (4) For an adiabatic process, $dQ =$ _____.
- (5) In an isochoric adiabatic process, change in internal energy of the system is _____.

[3]

Q.4 (A) Answer any one question.

- (1) Drawing equivalent circuit of UJT, discuss its working.
- (2) Write a note on basic logic gates.

[7]

Q.4 (B) Answer any one question.

- (1) Write a note on Multicolor LED.
- (2) Write a note on UJT relaxation oscillator.

[4]

Q.4 (C) Answer any three questions.

- (1) The power rating of LED is of order of _____.
- (2) A Photo diode is always connected in _____ biased.
- (3) The FET is a _____ controlled device.
- (4) _____ is also called double based diode.
- (5) A signal which is continuously varying with respect to time is called _____ signal.

[3]

Q.5 (A) Answer any one question.

- (1) Deriving an expression of current for L-C-R series a.c. circuit, explain series resonance and Q- factor.
- (2) Explaining principle and action of Phase shift oscillator, write its advantages and disadvantages.

[7]

Q.5 (B) Answer any one question.

- (1) Explain De Sauty bridge. Write its advantages and disadvantages.
- (2) Explain action of Colpitt oscillator.

[4]

Q.5 (C) Answer any three questions.

- (1) For inductive circuit, the value of Q – factor is about _____.
- (2) Resonant frequency does not depend upon the value of _____.
- (3) Owen's bridge is used to determine the value of an unknown _____.
- (4) _____ bridge is used to determine specific conductivity of an electrolyte.
- (5) Sinusoidal oscillator converts _____ energy into _____ energy.

[3]



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) $N_1 \ll N_2$ (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 $R = 100\text{ k}\Omega$ and $C = 0.01\mu\text{F}$. 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

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- (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 Fraunhofer 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 Colpitt'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.