Rekha V.V.I. Questions for 2022 Examination

Answers of below mentioned questions are present in your Rekha Examination Guide Part–II Physics – III (Hons.)

SHORT ANSWER TYPE QUESTIONS

Group – A
OPTICS

Fermat's Principle

Cardinal points of an optical system

Interference

Diffraction

Group – B
ELECTROMAGNETIC WAVES AND ELECTRODYNAMICS

Maxwell's Equations

Reflection and Refraction of Electromagnetic Waves

Polarization of Electromagnetic Waves

Rotatory Polarisation

PHYSICS – 3 (Hons.) (2021)

Answer five questions, selecting two from each Group-A and Group-B, in which Q. No.1 is compulsory.

1. Answer any three questions of the following:
   (a) Describe Stoke's treatment for division of amplitude. 13
   (b) Use Fermat's principle to obtain the laws of reflection of light. 20
   (c) Differentiate between Fresnel's and Fraunhofer's class of diffraction. 13
   (d) Give the characteristics of electro-magnetic waves. 10
   (e) Give a brief explanation of propagation of electromagnetic wave in ionosphere. 101
   (f) What is Laurent's half shade Polarimeter ? Explain. 122

Group-A

2. Describe, with a neat diagram, the construction and working of Michelson interferometer. How the wavelength of light can be determined with the help of it? 41
3. Describe the construction and theory of a zone plate. Show that a zone plate has multiple foci. Compare the zone plate with a convex lens. 58
4. What are cardinal points of a thick lens? Derive thick lens formula. 32
5. Explain Fraunhofer diffraction through single slit. Draw the intensity distribution curve. 68

Group-B

6. State Poynting theorem. Obtain an expression for Poynting vector and explain its physical significance. 89
7. Obtain Maxwell's equations for electro-magnetic field from the basic laws of physics representing these equations and explain the concept of displacement current. 80
8. Describe the Babinet compensator and give the theory of its working. How can it be used for analysing elliptically polarised light? 114
9. Explain rotatory Polarization. Give analytical treatment of Fresnel's theory of rotatory polarization. Describe, in brief, experimental evidence in support of this theory. 118

PHYSICS – 3 (Hons.) (2020)

Answer five questions selecting two from each Group in which Q. No. 1 is compulsory.

1. Answer any three questions of the following :
   (a) Explain the Nodal and Cordinal point of a system of Co-axial lens. 11
   (b) State and explain condition for interference of Light. 12
   (c) Explain Helmholtz and Lagrange equations.
   (d) Explain the Rayleigh's criterion for limit of resolution. 15
   (e) What is Brewster's law ? Give an application of it. 17
   (f) What is optical fiber? Give the principle involved in its working. 19

Group-A

2. State and explain Fermat's principle. Use this principle to derive the lens formula. 26
3. Discuss the theory of diffraction at a straight edge and show that the bands produced are not equally spaced. 62
4. Give the theory of Newton's ring. How the wavelength of monochromatic source is determined? 38
5. What do you understand by resolving power of an optical instrument? Find an expresaion of resolving power of a plane transmission grating. 75

Group - B

6. State Maxwell's field equations and obtain an expression for the velocity of Propagation of plane electromagnetic wave in a medium of permeability μ and permitivity $\in$. 85
7. Derive Fresnel's formula for reflection and refraction of electromagnetic theory of light. What is Brewster angle? 93
8. Explain production and defection of linearly, elliptically and Circularly polarised light. 112
9. Write short notes on any two of the following :
   (a) Poynting vector 125
   (b) Zone plate 124
   (c) Babinet's compensator 128
   (d) Transverse nature of electromagnetic wave 124

PHYSICS - 3 (Hons.) (2019)

Answer five questions, selecting at least one from each Group, in which Q. No.1 is compulsory.

1. Answer any three questions of the following :
   (a) Use Fermat's Principle to obtain the laws of reflection of light. 20
   (b) Describe Stoke's treatment for division of amplitude. 13
   (c) Define diffraction of light. Differentiate between Fresnel's and Fraunhofer's class of diffraction. 13
   (d) Discuss the difference between zone plate and convex lens. 15
   (e) What do you mean by displacement current ? Compare this with conduction current. 16
   (f) Give the characteristics of electromagnetic waves. 10

Group -A

2. What are cardinal points of thick lens ? Obtain the thick lens formula. 32
3. Give the construction and theory of a plane diffraction grating. How it is used to measure wavelength of sodium light ? 77
4. Discuss Fraunhofer's diffraction due to a single slit explaining the formation of maxima and minima. 68
5. Describe, with neat diagram, the construction and working of Michelson interferometer. Discuss one of its application. 41

Group - B

6. Obtain Maxwell's equations of electromagnetic field from the basic laws of Physics representing these equations. 80
7. State Poynting vector of electromagnetic waves. Obtain Poynting theorem for the flow of electromagnetic energy in a medium. 89
8. Describe the Babinet Compensator and give the theory of its working. How can it be used for analysing elliptically polarised light? 114
9. Write notes on any two of the following.
   (i) Vector and Scalar Potentials 125
   (ii) Brewster's Law 127
   (iii) Nicol Prism 128
   (iv) Symmetric Nature of Dielectric Tensor

Rekha V.V.I. Questions for 2022 Examination

Answers of below mentioned questions are present in your Rekha Examination Guide Part–II Physics – IV (Hons.)

SHORT ANSWER TYPE QUESTIONS

Group – A
ELECTRICITY

Electromagnetic Induction

Varying Currents

Network Theorem and Circuit analysis

A.C. Circuits

Group – B
BASIC ELECTRONICS

Semi-conductor Diode

Bipolar Junction Transistor (BJT)

Two Terminal Devices and Their Applications

Amplifiers

Sinusoidal and Non-sinusoidal Oscillators

Digital Electronics

PHYSICS – 4 (Hons.) (2021)

1. Answer any three questions of the following:

   (a) State and prove maximum power transfer theorem. 62

   (b) Show that energy required to build a current I in a circuit of self- inductance L is $\frac{1}{2}$ LI^2. 10

   (c) Discuss the Barkhausen criterion for sustained oscillations. 18

   (d) Write the basic difference between BJT and JFET. 19

   (e) Explain why the base region of a transistor is made very thin compared to emitter and collector regions. 16

   (f) What is Photodiode? Explain. 82

Group-A

2. Explain Seebeck and Peltier effects. Derive the relations $\pi = T \cdot \frac{dE}{dT}$ and $\sigma = -T \frac{d^2E}{dT^2}$ 22

3. State and explain Thevenin's or Norton's theorem. Discuss how this theorem is useful in obtaining solution for complicated electrical networks. Give examples. 55,57

4. Give the complete theory of series resonant circuit. Discuss the sharpness of resonance. 74

5. Give the theory of Anderson's a. c. bridge. Draw its vector diagram. 30

Group-B

6. Explain, with circuit diagram, the working of a full wave rectifier using two p-n junction diodes. Calculate its efficiency and ripple factor. 94

7. Give the circuit diagram of a phase shift R-C- oscillator. Obtain the condition of sustained oscillations and deduce the frequency of oscillation. 100

8. Discuss the basic structure of N-channel JFET. Draw its characteristics. 123

9. Explain operational principles of OR, AND, NAND gates along with their truth table and Boolean expressions. How NAND gate is a universal gate? 128

PHYSICS – 4 (Hons.) (2020)

Answer five questions selecting two from each Group
in which Q. No. 1 is compulsory.

1. Answer any three questions of the following :
   (a) State and prove Reciprocity theorem. 61
   (b) Explain how laws of electromagnetic induction lead to self induction in a coil.
   (c) Explain the theory of generation of alternating current. 11
   (d) Explain α and β of a transistor. Find out the relation between them. 16
   (e) Give the operational Principle of NAND gate. How it is universal gate? 20
   (f) Define electrical power. Obtain the power factor of an ac circuit. 14

Group-A

2. Give the theory of ballistic galvanometer and explain its use to measure self inductance of a coil. 32
3. Investigate the growth of current in LCR circuit subjected to a steady e.m.f. 42
4. Explain how a rotating magnetic field is produced and hence discuss the theory of induction motor. 27
5. Explain T and TT equivalent two-port networks and establish their equivalence. 68

Group-B

6. Explain, with circuit diagram, the principle of operation of a transistorised Hartty oscillator. 111
7. Describe two stage transistor RC coupled amplifier and Calculate its voltage, gain in mid, low and high frequency regions. 100
8. State and prove De-Morgan's theorem. What is meant by demorganization? 132
9. Write notes on any two of the following :
   (a) LED 141
   (b) MOSFET 143
   (c) NAND and NOR gates 143
   (d) Zener diode 140

PHYSICS - 4 (Hons.) (2019)

Answer five questions selecting two from each Group
in which Q. No. 1 is compulsory.

1. Answer any three questions of the following :
   (a) State and prove maximum power transfer theorem. 62
   (b) Discuss the Q-factor of series resonant circuit. 13
   (c) What are the energy losses of a transformer ? How are they reduced ? 15
   (d) Explain the difference between n-type and p-type semiconductor. 15
   (e) Write the basic difference between BJT and JFET. 19

Group-A

2. Investigate the decay of current in CR Circuit. Obtain the condition of oscillatory discharge. 39
3. State and explain Norton's theorem. Discuss how this theorem is useful in obtaining solution for complicated electrical networks. Give example. 57
4. Give the theory of Anderson's a. c. bridge. Draw its vector diagram. 30
5. Give the theory of parallel resonant alternating current circuit. Define sharpness of resonance. Why this circuit is called a rejector circuit. 76

Group-B

6. What is Zener diode ? Explain its action as a voltage stabiliser. 81
7. Explain, with circuit diagram, the working of a full wave rectifier using two p-n junction diodes. Calculate its efficiency and ripple factor. 94
8. What is field effect transistor. Describe the construction and working of n-channel JFET. Discuss its working principle. 123
9. Explain, with truth table, the operational principle of AND, OR, NAND, gates. How NAND gate is an universal gate ? 128

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