

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

1. Distinguish between division of wavefront and division of amplitude. 9
2. Explain why in Newton's rings, the fringes near the centre are broader than those away from the centre. 9
3. Explain why electromagnetic theory is considered to be a better theory of light than the wave theory. 10
4. Describe the important properties of electromagnetic waves.
Or, Give the characteristics of electromagnetic waves. 10
5. What are Maxwell's field equations ? 10
6. Explain the significance of Poynting vector. 11
7. If a quarter-wave plate and half-wave plate be given to you, how would you proceed to distinguish them from each other ? 11
8. How would you change a left handed circularly polarised light beam into a right handed circularly polarised light ? 11
9. Explain the cardinal point of a system of co-axial lens. **V.V.I.** 11
10. Give the condition to produce sustained interference fringes.
Or, State and explain the condition for interference of light. **V.V.I.** 12
11. How will you find out the wavelength of monochromatic light using Michelson Interferometer ? 13
12. Explain Stoke's theorem for division of amplitude of light. 13
13. Define diffraction of light. Differentiate between Fresnel's and Fraunhofer's class of diffraction. 13
14. Discuss the difference and similarities between zone plate and convex lens. **V.V.I.** 15
15. Explain with neat diagram Rayleigh criterion for the limit of resolution. **V.V.I.** 15
16. What do you mean by displacement current ? Compare this with conduction current. **V.V.I.** 16
17. What is Brewster's law ? Give an application of it. **V.V.I.** 17
18. Explain the polarisation of electromagnetic waves. 18
19. What is population inversion ? How laser action takes place with population inversion ? 18
20. What is optical fibre ? Give the principle involved in its working. **V.V.I.** 19

Group – A
OPTICS

Fermat's Principle

1. State and explain Fermat's principle. Obtain the laws of reflection and refraction from it.
Or, Use Fermat's principle to obtain the laws of reflection of light. 20
2. State and explain Fermat's principle. Use this principle to derive the relation $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{r}$ for refraction at a single spherical surface. 23
3. State and explain Fermat's principle. Use this principle to derive the lens formula. **V. V. I.** 26

Cardinal points of an optical system

4. What are cardinal points of coaxial optical system ? State their characteristics and show their position on a diagram. Illustrate the use of these points in the formation of an image by a lens system. 29
5. What are the cardinal points of a thick lens ? Describe their physical significance and locate them for a thick double convex lens in air.
Or, What are cardinal point of thick lens ? Obtain the thick lens formula. 32

Interference

6. What is interference of light ? Discuss path difference and phase difference of two waves meeting at a point and how they form maximum and minimum of amplitude and energy ? 35
7. Give the theory of Newton's rings. How the wavelength of monochromatic source is defined ?
Or, Explain the formation of Newton's rings. Show how would you use them to determine the wavelength of sodium light. Derive the formula. **V. V. I.** 38
8. Explain the necessary theory how you can determine the refractive index of transparent liquid by Newton's ring or interference method. Deduce the formula used. 40

9. Describe with neat diagram, the construction and working of Michelson Interferometer. Discuss its application.
Or, Describe Michelson's Interferometer and explain how it can be used to obtain circular fringes with monochromatic light. 41
10. How is wavelength difference of sodium doublet determined by Michelson's interferometer ? 44
11. Show how the Michelson's Interferometer can be used to
 (i) measure the wavelength of monochromatic light 45
 (ii) determine the refractive index or the thickness of thin transparent film. 46
12. (a) What do you mean by coherence ? 46
 (b) Describe temporal coherence and spatial coherence, illustrating them with the help of suitable experiments. 47
13. (a) Discuss how the purity of spectral line is related with the concept of temporal coherence ? Show that the frequency of spread of a spectral line is of the order of the inverse of the coherence time. 49
 (b) How does the visibility of fringes depend on the degree of coherence ? 50

Diffraction

14. (a) Explain the phenomenon of diffraction of light. 51
 (b) Explain the difference between Fresnel and Fraunhofer class of diffraction. 52
 (c) Explain the difference between interference and diffraction of light. 52
15. (a) What are Fresnel's half-period zones ? 52
 (b) Explain the rectilinear propagation of light on the basis of wave theory of light. 56
16. What is a zone plate ? How is it constructed ? Give its theory and show that it has multiple focii. Compare its action with that of a convex lens.
Or, Describe the construction and theory of a zone plate. Show that a zone plate has maximum focii. Compare the zone plate with a convex lens. 58
17. Describe the diffraction pattern obtained at a straight edge.
Or, Discuss the theory of diffraction at a straight edge and show the bands produced are not equally spaced. **V. V. I.** 62
18. Discuss the characteristic features of diffraction at a circular aperture and their explanation. 65

19. Discuss Fraunhofer's diffraction due to a single slit explaining the formation of maxima and minima.
Or, Explain Fraunhofer's diffraction through single slit. Draw the intensity distribution curve. 68
20. Derive the intensity distribution for Fraunhofer diffraction pattern due to a double slit. 72
21. What do you understand by resolving power of an optical instrument ? Find an expression of resolving power of a plane transmission grating. **V. V. I.** 75
22. Give the construction and theory of plane diffraction grating. How it is used to measure wavelength of sodium light ? **V. V. I.** 77

Group – B

ELECTROMAGNETIC WAVES AND ELECTRODYNAMICS

Maxwell's Equations

1. Deduce Maxwell's electromagnetic field equations. Give the physical significance of these equations.
Or, Obtain Maxwell's equation for electromagnetic field from the basic laws of physics representing these equations. 80
2. 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 permittivity ϵ .
Or, Use Maxwell's field equations to obtain the velocity of propagation of plane electromagnetic waves in a homogeneous (isotropic) dielectric medium. **V. V. I.** 85
3. Discuss the covariance of Maxwell's equations under Lorentz transformations. 87
4. Define Poynting vector for electromagnetic waves. Obtain Poynting theorem for the flow of electromagnetic energy in a medium. 89

Reflection and Refraction of Electromagnetic Waves

5. Deduce Fresnel's laws of reflection and refraction from Electromagnetic theory of light.
Or, Derive Fresnel's formula for reflection and refraction of electromagnetic wave in free space. **V. V. I.** 93
6. Explain with necessary theory the phenomenon of total internal reflection of electromagnetic waves. 98

Polarization of Electromagnetic Waves

7. Explain propagation of electromagnetic waves in an anisotropic (crystalline) medium. 101
8. Explain Light propagation in uniaxial crystals. 103
9. Explain Light propagation in biaxial crystals. 105
10. Explain double refraction. 107
11. Describe theoretically the superposition of two linearly polarised light waves of the same frequency travelling in the same direction at right angles to the optic axis of a doubly refracting crystal with their optical vectors mutually perpendicular. 109
12. What do you mean by quarter-wave and half-wave plate ? Explain their use in the study of different types of polarised light. 110
13. Explain production and detection of linearly, elliptically and circularly polarised lights.
Or, How with the help of Nicol prism and quarter-wave plate, plane polarised light, circularly polarised light and elliptically polarised light are produced and detected ? **V. V. I.** 112
14. Describe the construction and theory of Babinet's compensator and explain how you would use it to analyse elliptically polarised light.
Or, Describe the Babinet compensator and give the theory of its working. How can it be used for analysing elliptically polarised light ? 114

Rotatory Polarisation

15. Explain rotatory polarisation. Give analytical treatment of Fresnel's theory of rotatory polarisation. Describe, in brief experimental evidence in support of this theory. 118
16. (a) Define specific rotation. 121
 (b) Describe the construction and working of a Laurent's half shade polarimeter. 122
17. **Write notes on the following : V. V. I.**
- (a) Transverse Nature of Electromagnetic Wave 124
- (b) Zone plate 124
- (c) Poynting vector
Or, Propagation of energy in E.M. Waves. 125
- (d) Scalar and Vector potentials
Or, Electromagnetic potentials 125
- (e) Brewster's Law 126
- (f) Nicol Prism 127
- (g) Babinet's Compensator 128
- (h) Rotatory Polarisation 129
- (i) Optical Fibre Communication 130

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. 15
 - (d) Explain the Rayleigh's criterion for limit of resolution. 17
 - (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 permittivity ϵ 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

- | | | |
|--|------|----|
| 1. Describe the important applications of Seebeck effect. | .... | 9 |
| 2. Define Mutual Induction. | .... | 10 |
| 3. Show that the energy required to build a current I in a circuit of self inductance L is $1/2 LI^2$. | | |
| Or , Deduce an expression for the “energy stored” in an Inductive circuit. | .... | 10 |
| 4. Describe some uses of Ballistic galvanometer. | .... | 10 |
| 5. Describe the basic feature of : | | |
| (i) Ideal constant voltage source | .... | 11 |
| (ii) Ideal constant current source. | .... | 11 |
| 6. State and explain Kirchhoff’s laws. | .... | 11 |
| 7. Explain the theory of generation of alternating current. | | |
| Or , Briefly describe A.C. Generator. V. V. I. | .... | 11 |
| 8. Explain the concept of lead and lag of current in a.c. circuit. | .... | 13 |
| 9. Discuss the Q-factor of a series resonant circuit. V. V. I. | .... | 13 |
| 10. Define electric power. Obtain the power factor of an A.C. Circuit. V. V. I. | .... | 14 |
| 11. What are energy losses of a transformer ? How are they reduced ? V. V. I. | .... | 15 |
| 12. Define semiconductor. | .... | 15 |
| 13. Distinguish between n -type and p -type semiconductors. V. V. I. | .... | 15 |
| 14. Voltage Current (V - I) equation for a P - N junction diode. | .... | 16 |
| 15. Explain why the base region of a transistor is made very thin compared to emitter and collector regions. | .... | 16 |
| 16. Explain α and β of a transistor. Find out the relation between them. V. V. I. | .... | 16 |
| 17. Discuss the Barkhausen criterion for sustained oscillation. | .... | 18 |
| 18. Write the basic difference between BJT & FET. | | |
| Or , Compare Field Effects Transistor with Bipolar Junction Transistor. | .... | 19 |
| 19. Discuss the advantages of FET. | .... | 19 |
| 20. Give the limitations of h -parameters. | .... | 20 |
| 21. Explain complement of a number. | .... | 20 |
| 22. Give the operational principle of NAND gate. How it is a universal gate. V. V. I. | .... | 20 |

Group – A
ELECTRICITY

Electromagnetic Induction

1. State and explain Seebeck and Peltier effect. 22
2. Define self-induction and coefficient of self-induction. Obtain the amount of energy stored in a self inductor when a direct current is gradually increased from $I = 0$ to $I = I_0$ 25
3. Explain how a rotating magnetic field is produced and hence discuss the theory of induction motor.
Or, What is rotating magnetic field ? Describe the working of a single phase induction motor. **V. V. I.** 27
4. Give the theory of Anderson’s A.C. Bridge. Draw its vector diagram.
Or, Describe Anderson’s bridge method for the measurement of inductance of a coil. Draw the vector diagram of the balanced bridge. 30
5. Give the theory of ballistic galvanometer and explain its use to measure self-inductance of a coil. **V. V. I.** 32

Varying Currents

6. Discuss the (a) growth and (b) decay of current in a circuit containing an inductance L and a resistance R in series, when a constant d.c. e.m.f. applied to it. 35
7. Discuss the growth and decay of current in a circuit containing a condenser and a resistance in series when a d.c. e.m.f. is applied to it.
Or, Investigate the decay of current in C - R circuit. Obtain the condition of discharge. **V. V. I.** 39
8. Investigate the growth of current in LCR circuit subjected to a steady e.m.f.
Or, A steady electromotive force is applied to a circuit containing a resistor, a capacitor and an inductor joining in series combination. Investigate the growth of current in the circuit and discuss the result. **V. V. I.** 42
9. What is a Ballistic galvanometer ? Describe the construction and theory of a moving coil ballistic galvanometer. Discuss the conditions under which it is aperiodic and ballistic.
Or, Give the construction and theory of a moving coil ballistic galvanometer with necessary damping corrections. 47

10. Explain damping correction. What is meant by “logarithmic decrement” ? Also mention its merits and demerits. 53

Network Theorem and Circuit analysis

11. State and prove Thevenin’s theorem. Discuss how this theorem is useful in obtaining solutions for complicated electrical networks. Give an example. 55
12. State and prove Norton’s Theorem. Discuss how this theorem is useful in obtaining solutions for complicated electrical networks. Give an example. 57
13. State and prove Superposition Theorem. 59
14. State and prove Reciprocity Theorem. **V. V. I.** 61
15. State and prove Maximum Power Transfer Theorem. 62
16. (a) What are Star and Delta connections ? 64
- (b) Show that in Star connection peak value of line voltage is $\sqrt{3}$ times the peak value of phase voltage, while in Delta connection, the peak value of line current is $\sqrt{3}$ times the peak value of phase current. 65
- (c) How are Star and Delta connections transformed from one to another ? 67
17. Explain T and π equivalent of two port networks and establish their equivalence. **V. V. I.** 68

A.C. Circuits

18. An alternating e.m.f. is applied to a circuit containing a resistance and capacitance in series. Derive an expression for the impedance, current and phase in the circuit. Draw a vector diagram. 71
19. Give the complete theory of series resonant circuit. Discuss the sharpness of resonance. 74
20. Discuss the theory of Parallel resonance circuit and obtain expressions for (a) impedance (b) the peak current I_0 in the circuit. Define Sharpness of resonance. Deduce Resonance frequency. What is the most practical use of this phenomenon ? Why is it called a Rejector circuit ?
Or, Give the theory of parallel resonant alternating current circuit. Define sharpness of resonance. Why this circuit is called a Rejector circuit ? **V. V. I.** 76

Group – B
BASIC ELECTRONICS

Semi-conductor Diode

1. What is semi-conductor diode and Zener diode ? Explain its action as a voltage stabiliser. **V. V. I.** 81
2. What is photo diode ? Explain its action. 82

Bipolar Junction Transistor (BJT)

3. What is transistor ? Discuss its working. 84
4. Describe transistors. Explain the method of obtaining the characteristics of $p-n-p$ transistor in $C-B$ mode. 85
5. Draw the circuit diagram and explain the method of obtaining the characteristics of $p-n-p$ transistor in common emitter arrangement. 87

Two Terminal Devices and Their Applications

6. Draw and explain the circuit diagram of a half-wave rectifier. Derive expressions for (a) average and R.M.S. values of the output current, (b) rectifier efficiency and (c) ripple factor. 89
7. Explain, giving a circuit diagram, the working of a full wave rectifier using two $p-n$ junction diode. Calculate (a) average and R.M.S. value of current (b) rectifier efficiency and (c) ripple factor. Show that the efficiency of this rectifier is twice and ripple factor is less than that of the half wave rectifier. 94
8. Draw a neat diagram of full wave bridge rectifier. Explain its working and advantages. 98

Amplifiers

9. Describe two stage transistor $R-C$ coupled amplifier and calculate its voltage gain in mid, low and high frequency regions.
Or, Give the circuit diagram of $R - C$ coupled transistorised amplifier and obtain an expression for the gain at different frequency ranges. 100
10. Derive expressions for
(i) Current gain (ii) Input resistance (iii) Voltage gain (iv) Power gain (v) Output resistance of a single stage common emitter transistor amplifier. 104

11. What do you understand by class A , class B and class C amplifiers ? Illustrate your answer with diagram. 108
12. Describe the principle of feed back in amplifiers. What are negative and positive feed back ? 109

Sinusoidal and Non-sinusoidal Oscillators

13. Explain with circuit diagram, the principle of operation of a transistorised Hartley oscillator.
Or, Explain with a neat circuit diagram the working of Hartley oscillator. Derive an expression for the condition of sustained oscillation and frequency of oscillation. **V. V. I.** 111
14. Draw the circuit diagram and explain the working of Colpitt's oscillator. Derive an expression for the condition of sustained oscillation and frequency of oscillation. 114
15. Give the circuit diagram of a phase shift $R-C$ oscillator. Obtain the condition for sustained oscillations and deduce the frequency of oscillation. What are the advantages of this oscillator ? 118
16. What is Astable multivibrator ? Draw a neat circuit diagram of Transistor Astable multivibrator and discuss its working. 120
17. What is field effect transistor (FET) ? Describe the construction and working principle of n -channel JFET.
Or, Discuss the basic structure of n -channel JFET. 123
18. Derive an expression for the pinch-off voltage. 126

Digital Electronics

19. Explain the operational principle of AND, OR, NAND, NOR gates. Give the truth table. How the NAND gate is an universal gate. 128
20. State and prove De-Morgan's theorem. What is meant by Demorganisation. **V. V. I.** 132
21. Explain the process of addition, subtraction, multiplication and division of binary system. 135
22. Discuss the laws of Boolean Algebra. 136
23. Write short notes on the following : **V. V. I.**
- (a) $p-n$ junction diode 138
- (b) h -parameter
Or, Hybrid parameters of a two-port network 139
- (c) Zener diode 140
- (d) Light Emitting Diode (LED) 141
- (e) Hartley Oscillator 142
- (f) MOSFET 143
- (g) NOR and NAND gate 143

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**

