Code No: R161207 **R16** SET - 1

I B. Tech II Semester Regular Examinations, April/May - 2017
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Account for the circular shape of 'Newton's rings' in interference pattern. (2M)
   b) What is meant by diffraction of light? (2M)
   c) Find the polarizing angle for a glass of refractive index 1.732. (2M)
   d) What are the characteristics of laser beam? (2M)
   e) Define Poynting vector. What is its significance? (2M)
   f) Explain the de Broglie hypothesis. (2M)
   g) Write any two applications of Hall effect. (2M)

PART –B

2. a) With ray diagram discuss the theory of thin films and derive the condition for constructive and destructive interference in the case of reflected system. (10M)
   b) A parallel beam of light (λ = 5890Å), is incident on a glass plate (μ = 1.5) such that angle of refraction into plate is 60^{o}. Calculate the smallest thickness of the plate which will make it appear dark by reflection. (4M)

3. a) What are the types of diffractions and give the differences between them. (5M)
   b) Obtain the condition for secondary minima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima. (9M)

4. a) Explain the principle and working of Nicol prism with neat sketch. (10M)
   b) Find the minimum thickness of half and quarter wave plates for a light beam, λ=589.3nm if μ_e= 1.48640 and μ_o= 1.65833. (4M)

5. a) With the help of suitable diagrams, explain the principle, construction and working of a He-Ne laser. (10M)
   b) Mention some important applications of lasers. (4M)

6. a) Derive time independent Schrodinger wave equation for a free particle. (10M)
   b) Explain the physical significance of wave function. (4M)

7. a) Describe the drift and diffusion currents in a semiconductor. (6M)
   b) Derive Einstein's equation. (8M)
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Code No: R161207 **R16** SET - 2

I B. Tech II Semester Regular Examinations, April/May - 2017
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What are the conditions for Constructive and Destructive interference to take place? (2M)
   b) What is the shape of the incident wave front in i) Frenel's, ii) Fraunhofer's diffraction? (2M)
   c) What are Quarter and Half wave plates? (2M)
   d) In Lasers, What does the word 'population' mean? (2M)
   e) State Gauss's theorem. (2M)
   f) Write any two drawbacks of Classical free electron theory. (2M)
   g) What are Extrinsic semiconductors? Give one example. (2M)

PART –B

2. a) Account for the circular shape of 'Newton's rings' in interference pattern. (4M)
   b) Obtain the expressions for the diameters of the n^{th} dark and bright rings in the case of Newton's rings. (10M)

3. a) What is Rayleigh's Criterion for resolving power? (4M)
   b) Define Resolving power of a grating. Derive the expression for Resolving power of a grating based on Rayleigh's Criterion. (10M)

4. a) With the help of suitable diagram, explain the principle, construction and working of a He-Ne laser. (10M)
   b) Calculate the wavelength of emitted radiation from GaAs which has a band gap of 1.44 ev. (4M)

5. a) Show that the wavelength associated with an electron of mass 'm' and kinetic energy É' is given by $\lambda = \frac{\square}{\sqrt{\square\square}}$. (10M)
   b) Calculate the de Broglie wavelength of a proton whose kinetic energy is 1Mev. (4M)

6. a) What is Fermi level? (2M)
   b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution. (7M)
   c) Explain the concept of effective mass of an electron. (5M)

7. a) State and explain Hall effect. (7M)
   b) Show that for n-type semiconductor the Hall coefficient $R_H = -\frac{\square}{\square}$. (7M)
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Code No: R161207 **R16** SET - 3

I B. Tech II Semester Regular Examinations, April/May - 2017
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Explain the principle of Superposition of waves. (2M)
   b) What is the condition for the first minima in diffraction pattern due to single slit of width a, incident light of wavelength λ and with angle of Diffraction θ? (2M)
   c) What is meant by Double Refraction? (2M)
   d) What are the life times of excited state and metastable state? (2M)
   e) Write any two properties of Electromagnetic waves. (2M)
   f) Define the terms 'Drift Velocity' and 'Mean free path'. (2M)
   g) What are the charge carriers in Conductors and Semiconductors? (2M)

PART –B

2. a) Account for the circular shape of 'Newton's rings' in interference pattern. (4M)
   b) Obtain the expressions for the diameters of the n^{th} dark and bright rings in the case of Newton's rings. (10M)

3. a) Discuss Fraunhofer single slit diffraction. Draw intensity distribution curves and give conditions for bright and dark fringes in single slit diffraction pattern. (10M)
   b) Calculate the possible order of spectra with a plane transmission grating having 18,000 lines per inch when light of wavelength 4500 Å is used. (4M)

4. a) Explain the principle and working of Nicol prism with neat sketch. (10M)
   b) The refractive index of calcite for ordinary ray is 1.658 and for extra ordinary ray it is 1.486. The slice having the thickness $0.9x10^{-4}$ cm is cut from the crystal. For what wavelength this slice acts as half wave plate? (4M)

5. a) With the help of suitable diagrams, explain the principle, construction and working of a He-Ne laser. (10M)
   b) Mention some important applications of lasers. (4M)

6. a) Derive time independent Schrodinger wave equation for a free particle. (10M)
   b) Explain the physical significance of wave function. (4M)

7. a) Write notes on classification of semiconductors. (4M)
   b) Derive an expression for intrinsic carrier concentration in an intrinsic semiconductor. (10M)

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Code No: R161207 **R16** SET - 4

I B. Tech II Semester Regular Examinations, April/May - 2017
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What are the necessary conditions for obtaining interference fringes? (2M)
   b) When white light incidents on a diffraction grating, what coloured light will be diffracted more? Why? (2M)
   c) Explain Brewster's law. (2M)
   d) What are the life times of ground state and excited state? (2M)
   e) Write any two properties of Electromagnetic waves. (2M)
   f) Explain the concept of matter waves. (2M)
   g) What are n-type and p-type semiconductors? (2M)

PART –B

2. a) With ray diagram discuss the theory of thin films and derive the condition for constructive and destructive interference in the case of reflected system. (10M)
   b) What is the thickness of the thinnest film of refractive index 1.33 in which the destructive interference of the yellow light (6000 Å) of a normally incident beam can take place by refection? (4M)

3. a) Explain what is meant by diffraction of light. How diffraction is different from interference? (5M)
   b) Obtain the condition for secondary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima. (9M)

4. a) Write notes on Pumping, Population inversion and lasing action. (5M)
   b) With neat diagram, describe the construction and working of Ruby laser. (9M)

5. a) Show that the wavelength associated with an electron of mass 'm' and kinetic energy É' is given by $\lambda = \frac{\square}{\sqrt{\square\square}}$. (10M)
   b) Calculate the de Broglie wavelength of a proton whose kinetic energy is 1Mev. (4M)

6. a) Give an account of the band theory of solids based on the Kronig-Penny model. (10M)
   b) Distinguish between semiconductors and insulators. (4M)

7. a) What is doping? Explain how the doping makes a semiconductor more useful. (4M)
   b) Derive an expression for intrinsic carrier concentration in an intrinsic semiconductor. (10M)

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