MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION

CHOICE BASED CREDIT SYSTEM

THIRD SEMESTER: PART II: PHYSICS

Paper III : Optics and Laser Physics
(With Non- Mathematics Combination)

Time: 3 Hours   Max. Marks: 75

Section-A (Essay type)
Answer All questions   **Marks :10x5 = 50**

1.a) Explain Chromatic aberration . Explain the condition for removal of Chromatic
   aberration using two lenses separated by a distance.
                          OR
  b) What is meant by spherical aberration? Deduce the condition for minimum spherical
   aberration in a combination of two lenses separated by a distance.

2. a) Explain the Young's double slit experiment with theory .
                          OR
  b) Explain the formation of   Newton's rings in reflected light. Explain the experimental
   determination of wave length of monochromatic light using Newton's rings.

3.a) Discuss the Fraunhoffer diffraction pattern due to single slit. Obtain expression for
   intensity distribution, position of the Maxima and Minima.
                          OR
  b) Explain how to determine the wavelength of light using a grating in the minimum
   deviation method.

4. a) Describe the construction and working of a Nicol prism.
                          OR
  b) Define specific rotation. Describe how specific rotation of sugar solution is determined
   experimentally.

5. a) What is the principle of Laser. Explain the construction and working of ruby laser.
                          OR
  b) What is total internal reflection? Describe an optical fiber and explain how a light ray
   propagates in it. Write its uses.

Section-B (Short answer type)
Answer any three questions   **Marks: 5 x3 = 15**

6. Explain the defect astigmatism and how it is eliminated.
7. Explain the formation of colours in thin films.
8. Write the differences between Frenel and Fraunhoffer diffraction.
9. What is double refraction explain.
10. What is Holography? Write its applications.

Section-C

Answer any two questions   **Marks: 5x2 = 10**

11. An achromatic lens of focal length 20 cm is to be made out of 2 thin crown and flint glass lenses in contact. If dispersive power of crown and flint glasses are 0.2 and 0.4 respectively, find the focal lengths of the lenses used.

12. In a Newton's rings experiment the diameter of the 16th ring was found to be 0.6 cm and that of 6th ring was 0.34cm if the wavelength of light used 5893 $\overset{0}{A}$. Find the radius of the Plano-convex lens used.

13. A plane diffraction grating in the second order shows an angle of diffraction 30^{0} at the mercury blue line of wavelength 4360 $\overset{0}{A}$. Calculate the number of lines per centimeter of the grating plate.

14. Determine the specific rotation of the given sample of sugar solution, if the plane of polarization is turned through 24^{0}. The length of tube containing 20% of sugar solution is 20cm.

15. An optical fiber has a core refractive index of 1.52 and a cladding refractive index of 1.48. Determine the critical angle at the core-cladding interface.

MODEL PAPER
THREE YEAR B.Sc DEGREE EXAMINATION
CHOICE BASED CREDIT SYSTEM
FOURTH SEMESTER: PART II: PHYSICS
Paper IV: Thermodynamics & Radiation physics
(For Non-Mathematics Combinations)

Time: 3 Hours   Max. Marks: 75

Section-A (Essay type)

Answer All questions   **Marks :10X5 =50**

1. a) Explain the construction and working of Thermo-electric thermometer.

OR

   b) Explain Maxwell's law of distribution of molecular speeds and verify experimentally.

2. a) Describe the working of a Carnot's engine and derive an expression for its efficiency.

OR

   b) What is entropy? Derive an expression for the change in entropy in reversible and irreversible process.

.3. a) What is Joule- Kelvin effect? Explain the porous plug experiment and also explain inversion temperature.

OR

   b) Explain adiabatic demagnetization. Describe an experiment of producing very low temperature.

4. a) What is black body? Explain the distribution of energy in the spectrum of black body.

OR

   b) Define solar constant. Explain how the solar constant and hence the temperature of the sun determined experimentally.

5.a) What is Seebeck effect? Explain the relation between temperature and thermo emf and define temperature of inversion and neutral temperature.

OR

   b) What are Peltier and Thomson effects? Define their coefficients. Write the differences Peltier and Seebeck effect.

Section-B (Short answer type)
Answer any three questions   **Marks: 5 X3 = 15**

6. Explain the zeroth law of thermodynamics.
7. Explain the entropy of the universe.
8. Write the applications of substances at low temperature.

9. Explain the disappearing filament optical pyrometer.
10. What is thermopile? Write its uses.

Section-C

Answer any two questions   **Marks: 5X2 = 10**

11. At what temperature is the r.m.s speed of hydrogen molecules twice their r.m.s speed at 27° C?

12. Find the efficiency of a Carnot's engine working between two temperatures 27° C and 327°C

13. Calculate the change in entropy when 10gm of ice at -10° C gets converted into water 50°C.

14. Determine the temperature of the body with the help of Wien's displacement law, given b value is 2.92×10^{-3} mK and maximum wave length is 4900 A$^{o.}$

15. In a thermocouple the cold junction is at 20°C and the neutral temperature is 270°C. Find the inversion temperature.

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CHOICE BASED CREDIT SYSTEM

THIRD SEMESTER: PART II: PHYSICS

Paper III : Optics and Laser Physics
(With Mathematics Combination)

Time: 3 Hours   Max. Marks: 75

Section-A (Essay type)

Answer All questions   **Marks :10x5 = 50**

1.a) Explain Chromatic aberration . Explain the condition for removal of Chromatic aberration using two lenses separated by a distance.

OR

b) What is meant by spherical aberration? Deduce the condition for minimum spherical aberration in a combination of two lenses separated by a distance.

2. a) Describe the experimental arrangement of biprism to find the wavelength of light.

OR

b) Explain the formation of Newton's rings in reflected light. Explain the experimental determination of wave length of monochromatic light using Newton's rings.

3.a) Discuss the Fraunhoffer diffraction pattern due to single slit. Obtain expression for intensity distribution , position of the Maxima and Minima.

OR

b) Explain how do you determine the wavelength of light using a grating in the normal incidence position .

4. a) Describe the construction and working of a Nicol prism.

OR

b) Define specific rotation. Describe how specific rotation of sugar solution is determined experimentally.

5. a) What is the principle of Laser. Explain the construction and working of ruby laser.

OR

b) What is total internal reflection? Describe an optical fiber and explain how a light ray propagates in it. Write its uses.

Section-B (Short answer type)

Answer any three questions   **Marks: 5 x3 = 15**

6. Explain the defect coma and how it is eliminated.
7. Explain the formation of colours in thin films.
8. Explain the construction and working of a zone plate.
9. What is double refraction explain.
10. What is Holography? Write its applications.

Section-C

Answer any two questions   **Marks: 5x2 = 10**

11. An achromatic lens of focal length 20 cm is to be made out of 2 thin crown and flint glass lenses in contact. If the dispersive power of crown and flint glasses are 0.2 and 0.4 respectively. Find the focal lengths of the lenses used.

12. In a Newton's rings experiment the diameter of the 16th ring was found to be 0.590 cm and that of 6th ring was 0.336cm if the wavelength of tight used $5893 \overset{0}{A}$. Find the radius of the Plano convex lens used.

13. A plane diffraction grating in the second order shows an angle of diffraction 40^0 at the mercury blue line of wavelength $4360 \overset{0}{A}$. Calculate the number of lines per centimeter of the grating plate.

14. Determine the specific rotation of the given sample of sugar solution, if the plane of polarization is turned through 26^0. The length of tube containing 20% of sugar solution is 20 cm.

15. An optical fiber has a core refractive index of 1.50 and a cladding refractive index of 1.45. Determine the critical angle at the core-cladding interface.

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THREE YEAR B.Sc DEGREE EXAMINATION

CHOICE BASED CREDIT SYSTEM

FOURTH SEMESTER: PART II: PHYSICS

Paper IV: Thermodynamics & Radiation physics
(For Mathematics Combinations)

Time: 3 Hours   Max. Marks: 75

Section-A (Essay type)

Answer All questions   **Marks :10x5 = 50**

1. a) Derive an expression for the Maxwell's law of distribution of molecular speeds in a gas.

OR

   b) What are transport phenomena? Derive an expression for the coefficient of viscosity of a gas.

2. a) Describe the working of a Carnot's engine and derive an expression for its efficiency.

OR

   b) What is entropy? Derive an expression for the change in entropy of a perfect gas undergoing a reversible process.

. 3.a) What are thermodynamic potentials? Derive Maxwell's thermodynamic relations.

OR

   b) State the Maxwell's thermodynamic equations and hence derive the ratio of specific heats.

4. a) What is Joule- Kelvin effect ? Explain the porous plug experiment and also explain inversion temperature.

OR

   b) Explain adiabatic demagnetization. Describe an experiment of producing very low temperature.

5. a) Deduce Wien's displacement law, Rayleigh Jeans law and Stefan's law from the Planck's law.

OR

   b) Define solar constant. Explain how the solar constant and hence the temperature of the sun determined experimentally.

Section-B (Short answer type)

Answer any three questions   **Marks: 5 x3 = 15**

6. Explain the mean free path of the molecules of a gas.
7. Explain the concept of Entropy and the entropy of the universe.
8. Explain the Clausius Claperon's Latent heat equation.

9. Write the applications of substances at low temperature.
10. What is a black body? Explain Ferry's black body.

Section-C

Answer any two questions   **Marks: 5x2 = 10**

11. At what temperature is the r.m.s speed of oxygen molecules twice their r.m.s speed at 27° C?

12. The efficiency of a Carnot's engine is 25% .On reducing the temperature of the sink by 50% the efficiency is 50%.What are the initial temperatures of the source and sink?

13. Calculate the change in entropy when 1gm of ice at -10° C gets converted into steam at 100^oC

14. Determine the temperature of the body with the help of Wien's displacement law, given b value is 2.92×10^{-3} mK and maximum wave length is $4900A^o$.

15. A body at 1500^oK emits maximum energy at a wavelength $20,000A^o$. If the sun emits maximum energy at a wavelength $6000A^o$, find the temperature of the sun.