Code No: R161103 **R16** SET - 1

**I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018**
**ENGINEERING PHYSICS**
(Only Agri E)

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**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**PART –A**

1. a) Can interference be observed with independent sources of light? Substantiate your answer. (2M)
   b) What is a grating equation. Explain the terms involved in it. (2M)
   c) Distinguish between plane polarized light and un-polarized light. (2M)
   d) What are polar and non-polar dielectric materials? (2M)
   e) What is meant by non-destructive testing of materials? (2M)
   f) Calculate the binding energy of a nitrogen nucleus in MeV from the following data: $m_H$ = 1.00783 u and $m_n$ = 1.00867 and m( ${}^{14}_{7}N$) = 14.00307 u. (2M)
   g) Write any two applications of ferromagnetic materials. (2M)

**PART -B**

2. a) Explain the theory of Newton's rings under reflected light. How can the refractive index of a liquid be determined using these fringes? (10M)
   b) In Newton's rings experiment the diameter of the $12^{th}$ ring changes from 1.45 cm to 1.25 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. (4M)
3. a) Define resolving power of a telescope in terms of limit of resolution. Derive an expression for the same. (10M)
   b) Two pin holes 1.5 mm apart are placed in front of a source of light of wavelength 5.5 x $10^{-5}$ cm and seen through a telescope with its objective of diameter of 0.4 cm. Find the maximum distance from the telescope at which the pin holes can be resolved. (4M)
4. a) Explain Einstein's theory of stimulated emission and derive an expression for the ratio between spontaneous emission and stimulated emission. (10M)
   b) Discuss any two merits of He-Ne laser over Ruby laser. (4M)
5. a) Elaborate the factors that affect the acoustics of buildings. Explain remedies for them. (10M)
   b) A hall of volume 1586 $m^3$ is found to have a reverberation time of 2s. If the area of the sound absorbing surface is 650 $m^2$, calculate the average absorption coefficient. (4M)
6. a) What is co-ordination number? Calculate the co-ordination number for a simple cubic, body centered cubic and face centered cubic lattice. (10M)
   b) A monochromatic beam of electrons with kinetic energy 235.2 eV undergoes first order Bragg's reflection in a crystal at a glancing angle of $9^0$ 12' 35". Calculate the interplanar spacing. (4M)
7. a) Derive an expression for internal field in case of one dimensional array of atoms in a dielectric solid. (10M)
   b) The atomic weight and density of sulphur are 32 and 2.08 x $10^3$kg $m^{-3}$ respectively. The electronic polarizability of the atom is 3.28x$10^{-40}$ F $m^{-2}$. If sulphur solid has a cubic structure, calculate the dielectric constant. (4M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R161103 **R16** SET - 2

**I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018**
**ENGINEERING PHYSICS**
(Only Agri E)

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**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**PART –A**

1. a) What are coherent sources? (2M)
   b) Write any two differences between interference and diffraction phenomena. (2M)
   c) What is the importance of metastable state? (2M)
   d) What are the causes of reverberation in a hall? (2M)
   e) Define atomic packing factor. What is its unit? (2M)
   f) Define plane of vibration and plane of polarization. (2M)
   g) What do you mean by spontaneous magnetization? (2M)

**PART -B**

2. a) Describe Michelson's interferometer with a neat sketch. Explain how this can be used to determine the wavelength of monochromatic light. (10M)
   b) In Michelson's interferometer, 100 fringes cross the field of view when the movable mirror is displaced through 0.0295 mm. Calculate the wavelength of monochromatic light used. (4M)
3. a) What is a plane diffraction grating? Explain qualitatively the formation of grating spectra. (10M)
   b) Monochromatic light of wavelength 6560 x $10^{-8}$ cm falls normally on a grating 2 cm wide. The first order spectrum is produced at an angle $18^0$ 14′ from the normal. Calculate the total number of lines on the grating. (4M)
4. a) Explain the operation of Helium Neon gas laser with essential components. Describe how stimulated emission takes place with the exchange of energy between Helium and Neon atoms. (10M)
   b) What is a half-wave plate? Explain its action on polarized light incident on it with its electric vector E making an angle with the optic axis of the half-wave plate. (4M)
5. a) Describe magnetostriction method of producing ultrasonic waves with a neat sketch. (10M)
   b) Calculate the natural frequency of 40 mm length of a pure iron rod with density 7.25 x $10^3$ kg/m$^3$ and Young's modulus 115 x $10^9$ N/m$^2$. (4M)
6. a) What is nuclear binding energy? Draw the binding energy curve. What information do you get from such a curve? (10M)
   b) Calculate the energy released in the following fusion reaction (4M)
   $${}_1H^2 + {}_1H^3 = {}_2He^4 + {}_0n^1$$
   Given that ${}_1H^2$ = 2.014102 amu; ${}_1H^3$= 3.016050 amu; ${}_2He^4$ = 4.002603 amu; ${}_0n^1$1.008665 amu
7. a) Classify dia, para and ferromagnetic materials on basis of their atomic origin. (10M)
   b) A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 Wb/m$^2$. Calculate magnetizing force and relative permeability of the material. (4M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R161103

**R16**

SET - 3

**I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018**
**ENGINEERING PHYSICS**
(Only Agri E)

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**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**PART –A**

1. a) Why Newton's rings are circular in shape? (2M)
   b) Define resolving power of a microscope. (2M)
   c) Elucidate the importance of optical resonator in lasers. (2M)
   d) Describe any two medical applications of ultrasonics. (2M)
   e) What is the difference between primitive cell and unit cell? (2M)
   f) Define specific rotation. (2M)
   g) Write any two applications of paramagnetic materials. (2M)

**PART -B**

2. a) Derive cosine law for thin film interference. Write down the conditions for brightness and darkness in reflected system. (10M)
   b) Parallel beam of light of 589.3 nm wavelength is incident at an angle of $45^0$ on a glass plate of refractive index 1.5. Calculate the smallest thickness of the glass plate for a band of minimum intensity. (4M)
3. a) Obtain conditions for maxima and minima in Fraunhofer diffraction due to double slit. Draw the intensity distribution curve. (10M)
   b) In double slit Fraunhofer diffraction, with slits of width 0.020 mm separated by 0.1 mm, calculate the fringe spacing on a screen 50 cm away from the slits if they are illuminated with blue light of wavelength 480 nm. (4M)
4. a) Explain the production of plane, circularly and elliptically polarized lights. (10M)
   b) Plane polarized light is incident normally on a piece of quartz cut with its face parallel to optic axis. Find the least thickness of the plate for which the ordinary and extra-ordinary waves combine to form plane polarized light. Given $\mu_o = 1.5442$, $\mu_e = 1.5533$ and $\lambda = 500$ nm. (4M)
5. a) Discuss Sabine's formula for time of reverberation and describe its application. (10M)
   b) The dimensions of an auditorium are 60 m x 15 m x 10 m and its interior surfaces have an average absorption co-efficient of 0.25. Find the reverberation time of the auditorium. (4M)
6. a) Draw the (110) and (111) planes and (110) and (111) directions in a simple cubic crystal. What do you infer from these diagrams? (10M)
   b) Sate and explain Bragg' law. (4M)
7. a) What are ferroelectric materials? Explain the variation in dielectric polarization with electric field for a ferroelectric material with the help of a graph. (10M)
   b) Calculate the electronic polarizability of Ar. Given number of Ar atoms at NTP are $2.7 \times 10^{25}$ / $m^3$ and dielectric constant of Ar is 1.0024. (4M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R161103 **R16** SET - 4

**I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018**
**ENGINEERING PHYSICS**
(Only Agri E)

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**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**PART –A**

1. a) Why central spot is dark in Newton's rings observed under reflection? (2M)
   b) What is limit of resolution? (2M)
   c) Define optical rotation. (2M)
   d) Distinguish between reverberation and echo. (2M)
   e) Define mass defect. (2M)
   f) What is lasing action? (2M)
   g) Explain electric polarization in dielectrics. (2M)

**PART -B**

2. a) Explain the phenomenon of interference. Describe any two methods to determine wavelength of light through this phenomenon. (10M)
   b) In Newton's rings experiment, the diameters of the $4^{th}$ and $12^{th}$ dark rings are 0.400 cm and 0.700 cm respectively. Find the diameter of $20^{th}$ dark ring. (4M)
3. a) State and explain Rayleigh's criterion for resolution. Apply it to find an expression for the resolving power of a grating. (10M)
   b) A grating of width 2 inches is ruled with 15000 lines / inch. Find the smallest wavelength separation that can be resolved in the second order at a mean wavelength of 5000Å. (4M)
4. a) Describe the construction and working of Laurent's half shade polarimeter. (10M)
   b) A glucose solution of unknown concentration when filled in a 12 cm long tube rotates linearly polarized light by $2.5^{o}$. If the specific rotation of glucose is $52^{o}$, what is the concentration? (4M)
5. a) With the help of a neat labeled circuit diagram explain the production of ultrasonic waves using a piezoelectric oscillator. (10M)
   b) Calculate the natural frequency of ultrasonic wave using the following data: Thickness of quartz plate = 5.5 $x10^{-3}$ m; Young's modulus of quartz = 8 x $10^{10}$ $N/m^2$; and Density = 2.65 x $10^3$ $kg/m^3$. (4M)
6. a) Write a note on working principle of fast breeder reactor. Explain its importance in nuclear energy production. (7M)
   b) Discuss the differences between fusion and fission reactions. (7M)
7. a) With the help of a graph explain the variation in magnetic induction with magnetic field for a ferromagnetic material. (10M)
   b) A magnetic field of 1800 A/m produces a magnetic flux of 3 x $10^{-4}$ Wb in an iron bar of cross-sectional area 0.2 $cm^2$. Calculate the susceptibility and the permeability. (4M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~