Code No: R161204 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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 coherent sources? (2M)
   b) Define Fraunhofer diffraction. (2M)
   c) What is the difference between polarised and unpolarised light? (2M)
   d) Define the term reverberation time. (2M)
   e) What are the lattice parameters for a unit cell? (2M)
   f) What is mass defect? (2M)
   g) What paramagnetic materials? Give examples. (2M)

PART -B

2. a) Describe construction and working of Michelson interferometer. Explain the formation of various fringes in it. (10M)
   b) Calculate the distance between successive positions of movable mirror of Michelson's interferometer giving best fringes in case of a sodium source having wavelengths 5896A^o and 5890A^o. What will be the change in path difference between two successive reappearances of the interference pattern? (4M)
3. a) Explain the resolving power of a microscope. Deduce and discuss an expression for it. (10M)
   b) A microscope is used to resolve two self – luminous objects separated by a distance 4.0×10^{-5} cm. if the wavelength of light is 5461A^o, compute the numerical aperture of the objective. (4M)
4. a) Describe Nicol prism, showing clearly how it is constructed and what is its action. (10M)
   b) Calculate the specific rotation if the plane of polarisation is turned through 26.4^o traversing 20cm length of 20% sugar solution. (4M)
5. a) Explain how ultrasonic waves can be produced by Magnetostriction oscillator method. Also mention its advantages. (10M)
   b) Calculate the frequency of ultrasonics waves using the data: thickness of quartz plate $= 5.5 \times 10^{-3}$m. (4M)
6. a) Describe the procedure for finding the miller indices. Show that for a cubic lattice, the distance between two successive planes is given by $d = \frac{a}{\sqrt{h^2+k^2+l^2}}$. (10M)
   b) The distance between (110) planes in a body cantered cubic structure is 0.203nm. What is the size of unit cell and radius of the atom? (4M)
7. a) Give the detailed discussion on various types of dielectric break down in dielectric materials. (8M)
   b) Explain how the local field is calculated for a cubic structure. (6M)
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Code No: R161204 **R16** SET - 2

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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) Define dielectric loss and dielectric break down. (2M)
   b) Write any two applications of Michelson's interferometer. (2M)
   c) Write Packing factor for BCC and FCC structures. (2M)
   d) Mention any two differences between fission and fusion processes. (2M)
   e) What are the differences between Piezoelectric and Magnetostriction methods? (2M)
   f) What are the characteristics of laser? (2M)
   g) Mention limitations of Nicol Prism. (2M)

PART -B

2. a) Give the theory of Newton's rings. Describe the experiment to determine the wavelength of monochromatic light using Newton's rings. (10M)
   b) In Newton rings arrangement a source is emitting two wavelengths $\lambda_1=6\times10^{-7}$m and $\lambda_2=5.9\times10^{-7}$m. It is found that n^{th} dark ring due to one wave length coincides with $(n+1)^{th}$ dark ring due to other. Find the diameter of n^{th} dark ring if the radius of curvature of the lens is 0.9m. (4M)

3. a) Explain in detail diffraction due to double slit and draw the intensity distribution curve. (8M)
   b) Calculate the missing orders in a double slit Fraunhofer diffraction pattern, if the widths of slits are 0.08×10^{-3} m and they are 0.4×10^{-3} m. (6M)

4. a) Explain the construction and working principle of He-Ne Laser with energy level diagram. What are the merits of He-Ne Laser? (8M)
   b) Deduce the between Einstein's coefficients. (6M)

5. a) What is non-destructive testing? Explain with principle how flaw in a solid can be detected by non-destructive method using ultrasonics. (8M)
   b) Derive Sabine's formula for reverberation time of a hall. (6M)

6. a) Explain phenomena of nuclear fission. Describe the physical process involved in the release of energy in the nuclear fission reaction. (7M)
   b) Distinguish between the nuclear fission and fusion reactions. (7M)

7. a) Explain the behaviour of diamagnetic, paramagnetic and ferromagnetic materials from the atomic point of view. (9M)
   b) A magnetic material shows net magnetisation of 3000A/m and induced magnetic field of 0.005 Wb/m^2. Calculate the intensity of magnetising field and permeability of the material. (5M)
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Code No: R161204 **R16** SET - 3

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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 sustained inference of light? (2M)
   b) What is the Rayleigh criterion of resolution? (2M)
   c) What are the characteristics of Laser? (2M)
   d) What is magnetostriction method? (2M)
   e) Define binding energy. (2M)
   f) Define coordination number and atomic packing factor. (2M)
   g) Write the properties of ferroelectric materials. (2M)

PART -B

2. a) Explain the construction and working of Michelson interferometer. Explain clearly the formation of circular. (8M)
   b) A thin film with refractive index 1.58 for light wavelength 5890A^o is placed in one arm of a Michelson interferometer. If there is a shift 20 fringes (6M)
3. a) Qualitatively analyse the spectrum obtained when a plane diffraction grating is exposed to monochromatic light of wavelength λ. (8M)
   b) A grating has 6000 lines/cm. Find the angular separation between two wavelengths of 500nm and 510nm in the 3rd order. (6M)
4. a) Describe working principle of Sacharimeter and explain how it is used in measuring the strength of a sugar solution. (7M)
   b) Explain how a quarter wave plate and half wave plate could be constructed. Describe their properties. (7M)
5. a) Explain in detail how the ultrasonic pulse technique is used for non destructive testing materials. (8M)
   b) Discuss magnetostriction versus piezoelectric transducers for power ultrasonic applications. (6M)
6. a) Derive Bragg's law and give its significance. (7M)
   b) Explain the terms mass defect, nuclear fusion and nuclear fission. Describe the functioning of a nuclear reactor. (7M)
7. a) How magnetic materials are classified based on magnetic field? Compare their properties. Give their characteristics and examples. (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 permeability of the material. (4M)

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Code No: R161204 **R16** SET - 4

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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) Define electric polarization and electric susceptibility. (2M)
   b) What are paramagnetic materials? Give one example. (2M)
   c) What are miller indices and draw the plane for (111)? (2M)
   d) Define mass defect and binding energy. (2M)
   e) Define reverberation and reverberation time. (2M)
   f) Write any two medical applications of lasers. (2M)
   g) Write the path difference for quarter wave plate and half wave plate. (2M)

PART -B

2. a) Derive cosine law. Write down the conditions for brightness and darkness in the reflected system. (8M)
   b) The diameter of the 5^{th} bright ring in Newton's ring experiment is $4x10^{-3}$m. Find the radius of curvature of the lens used, if the wavelength of light is 589nm. (6M)
3. a) Explain Rayleigh's criterion for resolution. Obtain an expression for the resolving power of a diffraction grating. (8M)
   b) A grating of width 2 inches is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in 2^{nd} order at a mean wavelength of 500nm. (6M)
4. a) Explain what are the Einstein transition probabilities. Obtain a relation between Einstein transition probabilities of spontaneous and stimulated emission of radiation. (8M)
   b) Describe the construction and working of ruby laser with a neat diagram. (6M)
5. a) Write down Sabine's formula. Explain the terms involve in it and describe the units of each of them. State the limitations of the formula. (7M)
   b) Discuss the important factors that affect the acoustics of a Hall and methods to maintain good acoustics. (7M)
6. a) Derive the expression for inter planar spacing 'd' between (hkl) planes of a cubic structure. (7M)
   b) Derive Bragg's law of crystal diffraction and give its significance. (7M)
7. a) Derive an expression for internal filed in a dielectric placed in field E. (7M)
   b) Deduce Claussius - Mossotti relation. (7M)

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Code No: R161204 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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 how Newton's rings are formed. (2M)
   b) What is Fraunhofer diffraction? (2M)
   c) Define plane of polarization and vibration. (2M)
   d) What are Miller indices? (2M)
   e) Define reverberation time. (2M)
   f) Draw B-H plot for ferromagnetic material. (2M)
   g) Discuss one application of ultrasonics. (2M)

PART -B

2. a) What is a thin film? Explain the cosine law and derive the conditions at which bright and dark fringes are obtained. (10M)
   b) Light of wavelength 5893 Å is reflected at nearly normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that it will appear (i) black and (ii) bright. (4M)

3. a) Define resolving power of an optical instrument. Deduce an expression for the same in the case of telescope. (10M)
   b) Calculate the aperture of the objective of a telescope which may be used to resolve two stars separated by 4.88×10^{-6} radians for light of wavelength 6000Å. (4M)

4. a) Discuss with suitable diagrams, the principle, construction, working and theory of Helium Neon laser. Explain the role of Helium atoms in this laser. (10M)
   b) How He-Ne laser is superior to Ruby laser. Explain. (4M)

5. a) Write short notes with examples on (i) Mass defect (ii) Binding Energy. (10M)
   b) Derive Bragg's law of x-ray diffraction. (4M)

6. a) Derive Sabine's formula for reverberation time of a hall. (10M)
   b) Explain the working of ultrasonic flaw detector. (4M)

7. a) Classify the magnetic materials based on the field and temperature. (10M)
   b) Obtain Clasius-Mossotti equation. (4M)
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Code No: R161204 **R16** SET - 2

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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) State the superposition theorem. (2M)
   b) Define resolving power of an optical instrument. (2M)
   c) Discuss various pumping methods used in the Lasers for obtaining population inversion. (2M)
   d) Define (i) Unit cell (ii) Co-ordination number (2M)
   e) A conference room has total volume of 2000 m^3. The magnitude of total absorption within the conference room is 100 sabine. Calculate the reverberation time. (2M)
   f) Discuss one application of ferromagnetic material. (2M)
   g) How can you define dielectric strength? (2M)

PART -B

2. a) Explain the theory of Newton's rings. Derive an expression for the radius of the n^{th} bright ring in Newton's rings. (10M)
   b) In a Newton's rings experiment, the diameter of the fifth dark ring is reduced to half of its value after introducing a liquid below the convex surface. Calculate the refractive index of liquid. (4M)
3. a) Obtain the condition for principal maximum in Fraunhofer diffraction due to single slit and derive an expression for width of the central maximum. (10M)
   b) A single slit of width 0.14 mm is illuminated normally by monochromatic light and diffraction bands are observed on a screen 2 m away. If the centre of the second dark band is 1.6 cm from the middle of the central bright band, determine the wavelength of light. (4M)
4. a) Describe the construction of Nicol prism and show how it can be used as a polarizer and analyzer. (10M)
   b) At what wavelength, the given quarter wave plate for wavelength 600nm, will act as half wave plate. (4M)
5. a) Classify various lattice types in the cubic crystal system and specify the effective number of lattice points per unit cell in each type. (10M)
   b) Write short notes on Fast breeder Reactors. (4M)
6. a) What is meant by magnetostriction? Explain how ultrasonics are produced in a magnetostriction oscillator. (10M)
   b) Calculate the reverberation time of a hall having its volume 3000 m^3 and the total sound absorption of 80 metric Sabine. Find out the additional sound absorption required for an optimum reverberation. (4M)

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7. a) Write a short note on Ferromagnetic and Ferroelectric materials. (10M)
   b) Discuss intrinsic breakdown in dielectrics. (4M)

Code No: R161204 **R16** SET - 3

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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) Express the conditions for bright and dark bands in terms of phase and path difference of two light waves when they interfere. (2M)
   b) Define limit of resolution. (2M)
   c) What is an optical rotation? (2M)
   d) State the Bragg's law. (2M)
   e) What is SONAR? Explain how ultrasonics is used in it. (2M)
   f) Write about non-linear dielectrics. (2M)
   g) Define Bohr magneton. (2M)

PART -B

2. a) Describe the construction and working of Michelson's interferometer. (10M)
   b) In Michelson interferometer when a transparent thin glass plate of refractive index 1.52 is introduced in the path of one of the beams, 100 fringes cross the field of view at a given point. The wave length of light used is $5000A^0$. Find the thickness of the plate. (4M)
3. a) Describe Fresnel theoretical explanation for diffraction phenomenon. Obtain an expression for angular separation in the case of Fraunhofer diffraction at double slit. (10M)
   b) In Fraunhofer diffraction due to a single slit, the screen is placed 2 m away from the slit. If the slit width is 0.2 mm and the first minimum lies 5mm on either side of the central maximum, find the wavelength of incident light. (4M)
4. a) What are Einstein coefficients? Derive the relations between them. (10M)
   b) Can we obtain light amplification in the absence of stimulated emission? Explain. (4M)
5. a) What are Miller indices? How are they obtained? (10M)
   b) Deduce an expression for the interplanar distance in terms of Miller indices for a cubic system. (4M)
6. a) Explain the inverse piezo electric effect. Describe the piezo electric method of producing ultrasonic waves. (10M)
   b) What is ultrasonic testing and explain the basic principle? (4M)
7. a) Explain hysteresis property exhibited by the Ferromagnetic and Ferroelectric materials with a graph. (10M)
   b) What is dielectric loss? Obtain an expression for tangent loss. (4M)
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Code No: R161204 **R16** SET - 4

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

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) Show that spacing between two circular rings decreases with increase of order in a Newton's rings experiment. (2M)
   b) What happens to the width of the central maximum in a single slit Fraunhofer diffraction pattern when the slit width is increased? (2M)
   c) Distinguish between ordinary light and laser light. (2M)
   d) What is packing fraction? (2M)
   e) Explain magnetostriction method for producing ultrasonics. (2M)
   f) Differentiate ferroelectrics from dielectrics. (2M)
   g) Why susceptibility of diamagnetic materials is negative? (2M)

PART -B

2. a) What are the coherent sources and discuss various types? Explain their role in the phenomenon of interference. (10M)
   b) When a thin sheet of transparent material of thickness 6.3×10^{-4} cm is introduced in the path of one of the interfering beams, the central fringe shifts to a position occupied by the sixth bright fringe. If λ=5460Å, find the refractive index of the sheet. (4M)

3. a) What is diffraction grating? Explain in detail the Fraunhofer's diffraction due to single slit. (10M)
   b) In a plane transmission grating, the angle of diffraction for the second order principal maximum for the wavelength 5000 Å is 30^0. Calculate the number of lines per cm of the grating. (4M)

4. a) Discuss various methods by which polarized light can be produced. (10M)
   b) What is quarter wave plate? Deduce extreme value of its thickness. (4M)

5. a) Obtain expressions for atomic radius, coordination number and packing fraction for SC, BCC and FCC lattices. (10M)
   b) Determine the number of atoms per unit cell of lead which has an FCC structure. Atomic weight of Pb = 207.2, density of Pb = 11.36×10^3kg/m3 and a= 3.2Å. Also $N_A = 6.023 \times 10^{26}$ /kg mole. (4M)
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6. a) Enumerate the features that an auditorium should have for good acoustics. (10M)
   b) Discuss any two applications of Ultrasonics in detail. (4M)
7. a) Derive a relation between internal field and applied electric field in a dielectric. (10M)
   b) Explain the properties of ferromagnetic materials. (4M)

Code No: R161204 **R16** SET - 1

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, Chem E, AE, Bio-Tech, AME, Min E, PE, PCE, Metal 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**

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PART –A

1. a) Define interference of light. (2M)
   b) Define resolving power of a microscope. (2M)
   c) What is the role of active substance in lasers? (2M)
   d) How dielectrics are different from insulators? (2M)
   e) What is a non-destructive method? (2M)
   f) State the Bragg's law. (2M)
   g) Write any two applications of paramagnetic materials. (2M)

PART -B

2. a) Describe how you would use Newton's rings to determine the wavelength of a monochromatic radiation and derive the relevant formula. (10M)
   b) Explain the interference of light due to thin films. (4M)

3. a) Explain the diffraction due to two parallel slits and give qualitative analysis for diffraction pattern obtained in this case. (10M)
   b) What are the types of diffraction and give the differences between them. (4M)

4. a) Obtain the relation between Einstein's coefficients for probabilities of spontaneous and stimulated emission. (10M)
   b) Explain the phenomenon of double refraction. (4M)

5. a) State and explain Sabine formula for reverberation. (7M)
   b) What is magnetostriction method? With a neat circuit diagram explain how ultrasonics are produced using this method. (7M)

6. a) Obtain an expression for the packing factor of FCC structure. (7M)
   b) Write any seven differences between fission and fusion reactions. (7M)

7. a) Obtain an expression for the internal field seen by an atom in an infinite array of atoms subjected to an external field. (10M)
   b) What is ferromagnetism? What are the distinguishing features of ferromagnetism? (4M)
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