

Seat No.	
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Day & Date: Tuesday 27-05-2025
Time: 03:00 PM To 06:00 PM

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Marks:14

14

- Page 1 of 16

- 6) Optimum reverberation time for speech is _____.
a) 0.5 to 1 sec b) 0 to 1 sec
c) 1 to 2 sec d) 2 to 3 sec
- 7) The sound waves with frequency less than 20 Hz are called _____.
a) audible waves b) infrasonic waves
c) ultrasonic waves d) above all
- 8) Bending of the light at corners of slit and penetration of waves into the regions of geometrical shadow is known as _____.
a) Polarization b) Diffraction
c) Dispersion d) Interference
- 9) Along optic axis, the speed of o-ray and e-ray is _____.
a) $V_e = V_o$ b) $V_e > V_o$
c) $V_e < V_o$ d) none of these
- 10) For population inversion _____.
a) $N_1 \gg N_2$ b) $N_1 = N_2$
c) $N_2 \gg N_1$ d) $N_2 = N_1$
- 11) The wavelength of emission from He-Ne laser is _____.
a) 545.5 nm b) 632.8 nm
c) 794.3 nm d) 337.5 nm
- 12) Holography means _____.
a) To get zero dimension image
b) To get 2D image of 3D object
c) To get 3D image of 3D object
d) To get 3D image of 2D object
- 13) The critical angle Φ_c for fiber optics is _____.
a) $\sin\left(\frac{n_1}{n_2}\right)$ b) $\sin^{-1}\left(\frac{n_1}{n_2}\right)$
c) $\sin\left(\frac{n_2}{n_1}\right)$ d) $\sin^{-1}\left(\frac{n_2}{n_1}\right)$
- 14) Dimensions of nanomaterials ranging from _____.
a) 2 to 5 nm b) 1 to 100 nm
c) 100 to 200 nm d) 0.1 to 10 nm

Seat No.	
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Set	P
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F.Y. (B. Tech) (Sem-I) (New) (NEP CBCS) Examination: March/April-2025
Engineering Physics
(BTCE0101) / (BTCSE0101) / (BTETE0101) / (BTEE0101) / (BTME0101) /
(BTECE0101)

Day & Date: Tuesday 27-05-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Make suitable assumptions if necessary.

Section – I

Q.2 Attempt any SIX of the following: 18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Represent with diagrams the position of Fermi level in
 - P-type, and
 - N-type semiconductors.
- Define atomic packing factor and obtain its values for SC and BCC.
- Define Coordination number and obtain the values for SC, BCC and FCC structure.
- Write applications of ultrasonic waves.
- What are the basic acoustic requirements of a good auditorium?
- A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m² applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be 37 μV. What is the Hall coefficient of this semiconductor?
- Lead is FCC with an atomic radius of $r = 1.746 \text{ \AA}$. Find the spacing of:
 - (200) planes
 - (220) planes

Q.3 Attempt any TWO of the following: 10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- c) State and explain the factors affecting the architectural acoustics and their remedies.
- d)
 - i) Calculate the interplanar spacing (201) planes in a cubic crystal of lattice constant 4.3×10^{-8} cm.
 - ii) The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.

Section – II**Q.4 Attempt any SIX of the following:****18**

- a) Explain: Rayleigh's criterion of resolution.
- b) State and explain: Maull's law.
- c) Explain:
 - i) Stimulated Emission and
 - ii) Spontaneous Emission
- d) State properties of LASER.
- e) Explain: Structure of optical fibers with neat labeled diagrams.
- f) Explain: Types of carbon nano tubes (CNTs).
- g) How many orders will be visible if the wavelength of the incident radiation is $6500 \text{ \AA}$ and the number of lines/cm on the grating is 5000.
- h) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.40 respectively.

Q.5 Attempt any TWO questions.**10**

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$).
- c)
 - i) Calculate specific rotation, if the plane of polarization is rotated through 25° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
 - ii) Determine NA of a step index fibre when core refractive index $n_1 = 1.5$ and cladding refractive index $n_2 = 1.48$. Find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

Seat No.	
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Day & Date: Saturday, 25-05-2024
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- Donor type semiconductor is formed by adding impurity of valency _____.
 - 3
 - 5
 - 4
 - 6
- The band gap energy of silicon (Si) is approximately _____.
 - 0.3 eV
 - 1.1 eV
 - 0.7 eV
 - 2.1 eV
- Total axes of symmetry for cubic structure is _____.
 - 3
 - 6
 - 9
 - 13
- The co-ordination number in case of BCC structure is _____.
 - 6
 - 12
 - 8
 - 10
- The Bragg's law equation is _____.
 - $2d \sin \theta = d\lambda$
 - $3d \sin \theta = d\lambda$
 - $2d \sin \theta = n.\lambda$
 - $d \sin \theta = n.\lambda$
- Optimum reverberation time for speech is _____.
 - 0.5 to 1 sec
 - 0.5 to 2 sec
 - 1 to 2 sec
 - 2 to 3 sec
- The sound waves with frequency less than 20 Hz are called _____.
 - audible waves
 - infrasonic waves
 - ultrasonic waves
 - Above all
- Bending of the light at corners of slit and penetration of waves into the regions of geometrical shadow is known as _____.
 - polarization
 - diffraction
 - dispersion
 - interference

Seat No.	
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Set **P**

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Day & Date: Saturday, 25-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Attempt any six of the following:

18

- Derive an expression for Fermi energy in intrinsic semiconductors $E_F = \frac{E_g}{2}$
- Define: valence band, conduction band and energy gap. Represent with neat diagram.
- Explain: Bragg's law
- Define co-ordination number. Obtain co-ordination number for SC and FCC.
- Explain:
 - Magnetostriction effect, and
 - Piezo-electric effect
- Write applications of Ultrasonic waves.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip. Calculate hall voltage that appears across the strip if number of charge carriers is $8.4 \times 10^{28} / \text{m}^3$
- Determine the lattice constant for FCC lead crystal of radius $1.746 \text{ \AA}$. Also find the spacing of,
 - (200) planes,
 - (111) planes

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the inter-planer spacing for (3 2 1) plane in a simple cube lattice where constant is $4.2 \text{ \AA}$.
 - A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

Seat No.	
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Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.

- 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data wherever needed and mention it clearly.

Constants: 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$

- 2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

Duration: 30 Minutes

Q.1 Choose the correct alternatives from the given options.

14

- 1) Donor type semiconductor is formed by adding impurity of valency ____
a) 5
b) 4
c) 3
d) 6
- 2) The atomic radius of BCC lattice is ____
a) $\sqrt{2}a / 4$
b) $\sqrt{3}a / 4$
c) $a/2$
d) $a / 4$
- 3) A plane parallel to one of the co-ordinate axes has an intercept of ____
a) 1
b) 0
c) ∞
d) None of these
- 4) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency ____.
a) f
b) $f/2$
c) $3f$
d) $2f$
- 5) Optimum reverberation time for speech is ____
a) 0.5 to 1 second
b) 0 to 1 second
c) 1 to 2 second
d) Above 5 second
- 6) The Lorentz transformation equation for t co-ordinate from s to s' ____
a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$
b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx) / \sqrt{1 - v^2/c^2}$
d) $t = (t + vx) / \sqrt{1 - v^2/c^2}$
- 7) Einstein's mass energy relation ($E=mc^2$) shows that ____
a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
d) all the above statements are correct

- 8) The resolving power of a grating is _____
a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
c) $nNd\lambda$ d) $n(n+1)$
- 9) The specific rotation of a substance is _____ concentration of solution.
a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 10) Stimulated absorption process is represented by equation _____
a) $A^* \rightarrow A + h\nu$ b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A^*$ d) $A^* + h\nu \rightarrow A + h\nu$
- 11) LASER beam is _____
a) Highly directional b) Extremely bright
c) Monochromatic d) All of these
- 12) The fractional refractive index change (Δ) is given by _____.
a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$
- 13) The acceptance cone of fibre is equal to _____.
a) 2 x acceptance angle b) 3 x acceptance angle
c) 4 x acceptance angle d) None
- 14) The chirality of armchair CNT is _____.
a) (a, b) b) (a, a)
c) (a, 0) d) (0, b)

Seat No.	
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Set **P**

F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I**Q.2 Attempt any SIX of the following****18**

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000\text{\AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

**Seat
No.**

Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.

- 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
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- 4) Assume suitable data wherever needed and mention it clearly.

Constants: 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$
2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) The resolving power of a grating is ____
a) $\lambda/d\lambda$
b) $d\lambda/\lambda$
c) $nNd\lambda$
d) $n(n+1)$
- 2) The specific rotation of a substance is ____ concentration of solution.
a) independent of
b) directly proportional to
c) inversely proportional to
d) none of these
- 3) Stimulated absorption process is represented by equation ____
a) $A^* \rightarrow A + h\nu$
b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A^*$
d) $A^* + h\nu \rightarrow A + h\nu$
- 4) LASER beam is ____
a) Highly directional
b) Extremely bright
c) Monochromatic
d) All of these
- 5) The fractional refractive index change (Δ) is given by ____.
a) $\Delta = n_1 - n_2$
b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$
d) $\Delta = n_2 - n_1/n_1$
- 6) The acceptance cone of fibre is equal to ____
a) 2 x acceptance angle
b) 3 x acceptance angle
c) 4 x acceptance angle
d) None
- 7) The chirality of armchair CNT is ____
a) (a, b)
b) (a, a)
c) (a, 0)
d) (0, b)

- 8) Donor type semiconductor is formed by adding impurity of valency ____
a) 5
b) 4
c) 3
d) 6
- 9) The atomic radius of BCC lattice is ____
a) $\sqrt{2}a / 4$
b) $\sqrt{3}a / 4$
c) $a/2$
d) $a / 4$
- 10) A plane parallel to one of the co-ordinate axes has an intercept of ____
a) 1
b) 0
c) ∞
d) None of these
- 11) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency _____.
a) f
b) $f/2$
c) $3f$
d) $2f$
- 12) Optimum reverberation time for speech is _____.
a) 0.5 to 1 second
b) 0 to 1 second
c) 1 to 2 second
d) Above 5 second
- 13) The Lorentz transformation equation for t co-ordinate from s to s' _____.
a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$
b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx) / \sqrt{1 - v^2/c^2}$
d) $t = (t + vx) / \sqrt{1 - v^2/c^2}$
- 14) Einstein's mass energy relation ($E=mc^2$) shows that _____.
a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
d) all the above statements are correct

Seat No.	
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F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any SIX of the following

18

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II

Q.4 Attempt any SIX of the following:

18

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000\text{\AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.

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3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) LASER beam is _____.
a) Highly directional
b) Extremely bright
c) Monochromatic
d) All of these
- 2) The fractional refractive index change (Δ) is given by _____.
a) $\Delta = n_1 - n_2$
b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2 / n_1$
d) $\Delta = n_2 - n_1 / n_1$
- 3) The acceptance cone of fibre is equal to _____.
a) 2 x acceptance angle
b) 3 x acceptance angle
c) 4 x acceptance angle
d) None
- 4) The chirality of armchair CNT is _____.
a) (a, b)
b) (a, a)
c) (a, 0)
d) (0, b)
- 5) Donor type semiconductor is formed by adding impurity of valency _____.
a) 5
b) 4
c) 3
d) 6
- 6) The atomic radius of BCC lattice is _____.
a) $\sqrt{2}a / 4$
b) $\sqrt{3}a / 4$
c) $a/2$
d) $a / 4$
- 7) A plane parallel to one of the co-ordinate axes has an intercept of _____.
a) 1
b) 0
c) ∞
d) None of these

- 8) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency_____.

a) f b) $f/2$
c) $3f$ d) $2f$
- 9) Optimum reverberation time for speech is _____

a) 0.5 to 1 second b) 0 to 1 second
c) 1 to 2 second d) Above 5 second
- 10) The Lorentz transformation equation for t co-ordinate from s to s' _____

a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$ b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t = (t + vx)/\sqrt{1 - v^2/c^2}$
- 11) Einstein's mass energy relation ($E=mc^2$) shows that _____

a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
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a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
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- 13) The specific rotation of a substance is _____ concentration of solution.

a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 14) Stimulated absorption process is represented by equation _____

a) $A * \rightarrow A + h\nu$ b) $A * + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A *$ d) $A * + h\nu \rightarrow A + h\nu$

SLR-WF-491

Seat No.	
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Set R

F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any SIX of the following

18

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II

Q.4 Attempt any SIX of the following:

18

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000 \text{ \AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.
 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
 3) Figures to the right indicates full marks.
 4) Assume suitable data wherever needed and mention it clearly.

- Constants:** 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$
 2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
 3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) The Lorentz transformation equation for t co-ordinate from s to s' _____
 a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$ b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
 c) $t = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t = (t + vx)/\sqrt{1 - v^2/c^2}$
- 2) Einstein's mass energy relation ($E=mc^2$) shows that _____
 a) mass disappears to reappear as energy
 b) energy disappears to reappear as mass
 c) mass and energy are two different forms of the same
 d) all the above statements are correct
- 3) The resolving power of a grating is _____
 a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
 c) $nNd\lambda$ d) $n(n+1)$
- 4) The specific rotation of a substance is _____ concentration of solution.
 a) independent of b) directly proportional to
 c) inversely proportional to d) none of these
- 5) Stimulated absorption process is represented by equation _____
 a) $A * \rightarrow A + h\nu$ b) $A * + h\nu \rightarrow A + 2h\nu$
 c) $A + h\nu \rightarrow A *$ d) $A * + h\nu \rightarrow A + h\nu$
- 6) LASER beam is _____
 a) Highly directional b) Extremely bright
 c) Monochromatic d) All of these
- 7) The fractional refractive index change (Δ) is given by _____
 a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
 c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$

- 8) The acceptance cone of fibre is equal to _____
a) $2 \times$ acceptance angle b) $3 \times$ acceptance angle
c) $4 \times$ acceptance angle d) None
- 9) The chirality of armchair CNT is _____
a) (a, b) b) (a, a)
c) (a, 0) d) (0, b)
- 10) Donor type semiconductor is formed by adding impurity of valency _____
a) 5 b) 4
c) 3 d) 6
- 11) The atomic radius of BCC lattice is _____
a) $\sqrt{2}a / 4$ b) $\sqrt{3}a / 4$
c) $a/2$ d) $a / 4$
- 12) A plane parallel to one of the co-ordinate axes has an intercept of _____
a) 1 b) 0
c) ∞ d) None of these
- 13) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency _____.
a) f b) $f/2$
c) $3f$ d) $2f$
- 14) Optimum reverberation time for speech is _____
a) 0.5 to 1 second b) 0 to 1 second
c) 1 to 2 second d) Above 5 second

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I**Q.2 Attempt any SIX of the following****18**

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a) i) Determine the grating element of a grating if when illuminated with light of wavelength $4000 \text{ \AA}$, the second order spectrum is seen at an angle of 26.4°
ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.

- 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data wherever needed and mention it clearly.

Constants: 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$

- 2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) Donor type semiconductor is formed by adding impurity of valency ____
a) 5
b) 4
c) 3
d) 6
- 2) The atomic radius of BCC lattice is ____
a) $\sqrt{2}a / 4$
b) $\sqrt{3}a / 4$
c) $a/2$
d) $a / 4$
- 3) A plane parallel to one of the co-ordinate axes has an intercept of ____
a) 1
b) 0
c) ∞
d) None of these
- 4) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency ____.
a) f
b) $f/2$
c) $3f$
d) $2f$
- 5) Optimum reverberation time for speech is ____
a) 0.5 to 1 second
b) 0 to 1 second
c) 1 to 2 second
d) Above 5 second
- 6) The Lorentz transformation equation for t co-ordinate from s to s' ____
a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$
b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx) / \sqrt{1 - v^2/c^2}$
d) $t = (t + vx) / \sqrt{1 - v^2/c^2}$
- 7) Einstein's mass energy relation ($E=mc^2$) shows that ____
a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
d) all the above statements are correct

- 8) The resolving power of a grating is _____
a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
c) $nNd\lambda$ d) $n(n+1)$
- 9) The specific rotation of a substance is _____ concentration of solution.
a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 10) Stimulated absorption process is represented by equation _____
a) $A^* \rightarrow A + h\nu$ b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A^*$ d) $A^* + h\nu \rightarrow A + h\nu$
- 11) LASER beam is _____
a) Highly directional b) Extremely bright
c) Monochromatic d) All of these
- 12) The fractional refractive index change (Δ) is given by _____.
a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$
- 13) The acceptance cone of fibre is equal to _____
a) 2 x acceptance angle b) 3 x acceptance angle
c) 4 x acceptance angle d) None
- 14) The chirality of armchair CNT is _____
a) (a, b) b) (a, a)
c) (a, 0) d) (0, b)

Seat No.	
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F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any SIX of the following

18

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- Slate and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II

Q.4 Attempt any SIX of the following:

18

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000\text{\AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.

- 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data wherever needed and mention it clearly.

Constants: 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$
2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) The resolving power of a grating is _____.
a) $\lambda/d\lambda$
b) $d\lambda/\lambda$
c) $nNd\lambda$
d) $n(n+1)$
- 2) The specific rotation of a substance is _____ concentration of solution.
a) independent of
b) directly proportional to
c) inversely proportional to
d) none of these
- 3) Stimulated absorption process is represented by equation _____.
a) $A^* \rightarrow A + h\nu$
b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A^*$
d) $A^* + h\nu \rightarrow A + h\nu$
- 4) LASER beam is _____.
a) Highly directional
b) Extremely bright
c) Monochromatic
d) All of these
- 5) The fractional refractive index change (Δ) is given by _____.
a) $\Delta = n_1 - n_2$
b) $\Delta = n_2 - n_1$
c) $\Delta = n_1 - n_2/n_1$
d) $\Delta = n_2 - n_1/n_1$
- 6) The acceptance cone of fibre is equal to _____.
a) 2 x acceptance angle
b) 3 x acceptance angle
c) 4 x acceptance angle
d) None
- 7) The chirality of armchair CNT is _____.
a) (a, b)
b) (a, a)
c) (a, 0)
d) (0, b)

- 8) Donor type semiconductor is formed by adding impurity of valency ____
a) 5
b) 4
c) 3
d) 6
- 9) The atomic radius of BCC lattice is ____
a) $\sqrt{2}a / 4$
b) $\sqrt{3}a / 4$
c) $a/2$
d) $a / 4$
- 10) A plane parallel to one of the co-ordinate axes has an intercept of ____
a) 1
b) 0
c) ∞
d) None of these
- 11) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency _____.
a) f
b) $f/2$
c) $3f$
d) $2f$
- 12) Optimum reverberation time for speech is _____.
a) 0.5 to 1 second
b) 0 to 1 second
c) 1 to 2 second
d) Above 5 second
- 13) The Lorentz transformation equation for t co-ordinate from s to s' _____.
a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$
b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx) / \sqrt{1 - v^2/c^2}$
d) $t = (t + vx) / \sqrt{1 - v^2/c^2}$
- 14) Einstein's mass energy relation ($E=mc^2$) shows that _____.
a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
d) all the above statements are correct

Seat No.	
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F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any SIX of the following

18

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II

Q.4 Attempt any SIX of the following:

18

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000 \text{ \AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Set **R**

F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.
 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
 3) Figures to the right indicates full marks.
 4) Assume suitable data wherever needed and mention it clearly.

- Constants:** 1) Avogadro's No. $N = 6.02 \times 10^{26}$ / k.mol
 2) Velocity of light. $c = 3 \times 10^8$ m / sec
 3) Charge of electron. $e = 1.6 \times 10^{-19}$ C

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) LASER beam is _____
 a) Highly directional b) Extremely bright
 c) Monochromatic d) All of these
- 2) The fractional refractive index change (Δ) is given by _____.
 a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
 c) $\Delta = n_1 - n_2 / n_1$ d) $\Delta = n_2 - n_1 / n_1$
- 3) The acceptance cone of fibre is equal to _____.
 a) 2 x acceptance angle b) 3 x acceptance angle
 c) 4 x acceptance angle d) None
- 4) The chirality of armchair CNT is _____.
 a) (a, b) b) (a, a)
 c) (a, 0) d) (0, b)
- 5) Donor type semiconductor is formed by adding impurity of valency _____.
 a) 5 b) 4
 c) 3 d) 6
- 6) The atomic radius of BCC lattice is _____.
 a) $\sqrt{2}a / 4$ b) $\sqrt{3}a / 4$
 c) $a/2$ d) $a / 4$
- 7) A plane parallel to one of the co-ordinate axes has an intercept of _____.
 a) 1 b) 0
 c) ∞ d) None of these

- 8) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency_____.

a) f b) $f/2$
c) $3f$ d) $2f$
- 9) Optimum reverberation time for speech is _____

a) 0.5 to 1 second b) 0 to 1 second
c) 1 to 2 second d) Above 5 second
- 10) The Lorentz transformation equation for t co-ordinate from s to s' _____

a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$ b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
c) $t = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t = (t + vx)/\sqrt{1 - v^2/c^2}$
- 11) Einstein's mass energy relation ($E=mc^2$) shows that _____

a) mass disappears to reappear as energy
b) energy disappears to reappear as mass
c) mass and energy are two different forms of the same
d) all the above statements are correct
- 12) The resolving power of a grating is _____

a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
c) $nN\Delta\lambda$ d) $n(n+1)$
- 13) The specific rotation of a substance is _____ concentration of solution.

a) independent of b) directly proportional to
c) inversely proportional to d) none of these
- 14) Stimulated absorption process is represented by equation _____

a) $A * \rightarrow A + h\nu$ b) $A * + h\nu \rightarrow A + 2h\nu$
c) $A + h\nu \rightarrow A *$ d) $A * + h\nu \rightarrow A + h\nu$

SLR-WF-491

Seat No.	
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Set R

F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any SIX of the following

18

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II

Q.4 Attempt any SIX of the following:

18

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000\text{\AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in Answer Book. Page No.3 (starting page of the Answer Book). Each question carry one mark.
 2) Don't forget to mention Question Paper Set (P/Q/R/S) at the top of the same page.
 3) Figures to the right indicates full marks.
 4) Assume suitable data wherever needed and mention it clearly.

- Constants:** 1) Avogadro's No. $N = 6.02 \times 10^{26} / \text{k.mol}$
 2) Velocity of light. $c = 3 \times 10^8 \text{ m / sec}$
 3) Charge of electron. $e = 1.6 \times 10^{-19} \text{ C}$

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the given options.

14

- 1) The Lorentz transformation equation for t co-ordinate from s to s' _____
 a) $t = (t + vx/c^2) / \sqrt{1 - v^2/c^2}$ b) $t = (t - vx/c^2) / \sqrt{1 - v^2/c^2}$
 c) $t = (t - vx)/\sqrt{1 - v^2/c^2}$ d) $t = (t + vx)/\sqrt{1 - v^2/c^2}$
- 2) Einstein's mass energy relation ($E=mc^2$) shows that _____
 a) mass disappears to reappear as energy
 b) energy disappears to reappear as mass
 c) mass and energy are two different forms of the same
 d) all the above statements are correct
- 3) The resolving power of a grating is _____
 a) $\lambda/d\lambda$ b) $d\lambda/\lambda$
 c) $nNd\lambda$ d) $n(n+1)$
- 4) The specific rotation of a substance is _____ concentration of solution.
 a) independent of b) directly proportional to
 c) inversely proportional to d) none of these
- 5) Stimulated absorption process is represented by equation _____
 a) $A * \rightarrow A + h\nu$ b) $A * + h\nu \rightarrow A + 2h\nu$
 c) $A + h\nu \rightarrow A *$ d) $A * + h\nu \rightarrow A + h\nu$
- 6) LASER beam is _____
 a) Highly directional b) Extremely bright
 c) Monochromatic d) All of these
- 7) The fractional refractive index change (Δ) is given by _____
 a) $\Delta = n_1 - n_2$ b) $\Delta = n_2 - n_1$
 c) $\Delta = n_1 - n_2/n_1$ d) $\Delta = n_2 - n_1/n_1$

- 8) The acceptance cone of fibre is equal to _____
a) $2 \times$ acceptance angle b) $3 \times$ acceptance angle
c) $4 \times$ acceptance angle d) None
- 9) The chirality of armchair CNT is _____
a) (a, b) b) (a, a)
c) (a, 0) d) (0, b)
- 10) Donor type semiconductor is formed by adding impurity of valency _____
a) 5 b) 4
c) 3 d) 6
- 11) The atomic radius of BCC lattice is _____
a) $\sqrt{2}a / 4$ b) $\sqrt{3}a / 4$
c) $a/2$ d) $a / 4$
- 12) A plane parallel to one of the co-ordinate axes has an intercept of _____
a) 1 b) 0
c) ∞ d) None of these
- 13) If f is the frequency of alternating current supplied to a coil producing magnetic field then the rod kept in magnetic field vibrates with the frequency _____.
a) f b) $f/2$
c) $3f$ d) $2f$
- 14) Optimum reverberation time for speech is _____
a) 0.5 to 1 second b) 0 to 1 second
c) 1 to 2 second d) Above 5 second

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem-I) (New) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10101)

Day & Date: Tuesday, 11-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I**Q.2 Attempt any SIX of the following****18**

- Classify insulator, semiconductor & conductor on the basis of energy band structure
- Explain with diagrams the position of Fermi level in
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC, BCC crystals.
- State the properties of ultrasonic waves.
- Derive an expression for Time dilation.
- Derive the relation $E = mc^2$
- Determine the lattice constant for FCC lead crystal of radius 1.746 Å. Also find the spacing of
 - (111) planes
 - (200) planes
- The reverberation time of a hall is 1.5 s and the area of interior surface is 3340 m². If the volume of the hall is 12000 m³. Find the absorption coefficient.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + K^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- What is speed of clock to keep correct time w.r.to observer, so that it may seem to lose 1 min per day.
 - At what speed the mass of an object will be double of its value at rest.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Derive an expression for the resolving power of a plane diffraction grating.
- State & Explain Malus law
- Explain in brief
 - Population inversion
 - Pumping

- d) Write any five applications of laser in different fields.
- e) Describe the principle (Total Internal Reflection) on which optical fiber works.
- f) Explain different types of carbon nano tubes.
- g) In an optical fiber the core material has refractive index 1.6 and refractive index of cladding material is 1.3. Calculate the value of angle of acceptance.
- h) What is the De Broglie wavelength of an electron that has a momentum of $4.56 \times 10^{-27} \text{ kg.m/s}$? (Given $h = 6.63 \times 10^{-34} \text{ J.s}$)

Q.5 Attempt any TWO of the following:**10**

- a)
 - i) Determine the grating element of a grating if when illuminated with light of wavelength $4000 \text{ \AA}$, the second order spectrum is seen at an angle of 26.4°
 - ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° traversing 20 cm, length of 20% sugar solution.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Explain in detail Davisson Germer experiment.

Seat No.	
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Day & Date: Saturday, 25-05-2024
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- 1) Donor type semiconductor is formed by adding impurity of valency _____.
a) 3 b) 5
c) 4 d) 6
- 2) The band gap energy of silicon (Si) is approximately _____.
a) 0.3 eV b) 1.1 eV
c) 0.7 eV d) 2.1 eV
- 3) Total axes of symmetry for cubic structure is _____.
a) 3 b) 6
c) 9 d) 13
- 4) The co-ordination number in case of BCC structure is _____.
a) 6 b) 12
c) 8 d) 10
- 5) The Bragg's law equation is _____.
a) $2d \sin \theta = d\lambda$ b) $3d \sin \theta = d\lambda$
c) $2d \sin \theta = n.\lambda$ d) $d \sin \theta = n.\lambda$
- 6) Optimum reverberation time for speech is _____.
a) 0.5 to 1 sec b) 0.5 to 2 sec
c) 1 to 2 sec d) 2 to 3 sec
- 7) The sound waves with frequency less than 20 Hz are called _____.
a) audible waves b) infrasonic waves
c) ultrasonic waves d) Above all
- 8) Bending of the light at corners of slit and penetration of waves into the regions of geometrical shadow is known as _____.
a) polarization b) diffraction
c) dispersion d) interference

Seat No.	
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Set **P**

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Day & Date: Saturday, 25-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Attempt any six of the following:

18

- Derive an expression for Fermi energy in intrinsic semiconductors $E_F = \frac{E_g}{2}$
- Define: valence band, conduction band and energy gap. Represent with neat diagram.
- Explain: Bragg's law
- Define co-ordination number. Obtain co-ordination number for SC and FCC.
- Explain:
 - Magnetostriction effect, and
 - Piezo-electric effect
- Write applications of Ultrasonic waves.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip. Calculate hall voltage that appears across the strip if number of charge carriers is $8.4 \times 10^{28} / \text{m}^3$
- Determine the lattice constant for FCC lead crystal of radius $1.746 \text{ \AA}$. Also find the spacing of,
 - (200) planes,
 - (111) planes

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the inter-planer spacing for (3 2 1) plane in a simple cube lattice where constant is $4.2 \text{ \AA}$.
 - A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

Section – II

Q.4 Attempt any SIX of the following.**18**

- a) Explain: Rayleigh's criterion of resolution.
- b) State and explain: Maudslaw's law.
- c) Explain:
 - i) Stimulated Emission and
 - ii) Spontaneous Emission
- d) State properties of LASER.
- e) Explain structure of optical fibers with neat labeled diagrams.
- f) Explain: Types of carbon nano tubes (CNTs).
- g) How many orders will be visible if the wavelength of the incident radiation is 6500 Å and the number of lines/cm on the grating is 5000.
- h) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.40 respectively.

Q.5 Attempt any TWO of the following:**10**

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$).
- c)
 - i) Calculate specific rotation, if the plane of polarization is rotated through 25° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
 - ii) Determine NA of a step index fibre when core refractive index $n_1 = 1.5$ and cladding refractive index $n_2 = 1.48$. Find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

Seat No.	
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Day & Date: Saturday, 25-05-2024
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- 1) Bending of the light at corners of slit and penetration of waves into the regions of geometrical shadow is known as _____.
a) polarization
b) diffraction
c) dispersion
d) interference
- 2) Along optic axis, the speed of o-ray and e-ray is _____.
a) $V_e = V_o$
b) $V_e > V_o$
c) $V_e < V_o$
d) None of these
- 3) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as _____.
a) depumping
b) lasing action
c) population inversion
d) pumping
- 4) In He-Ne lasers, the ratio of He-Ne is in the order _____.
a) 1:10
b) 10:1
c) 1:1
d) 100:1
- 5) Holography means _____.
a) To get zero dimension image
b) To get 2D image of 3D object
c) To get 3D image of 3D object
d) To get 3D image of 2D object
- 6) The critical angle Φ_c for fiber optics is _____.
a) $\sin\left(\frac{n_1}{n_2}\right)$
b) $\sin^{-1}\left(\frac{n_1}{n_2}\right)$
c) $\sin\left(\frac{n_2}{n_1}\right)$
d) $\sin^{-1}\left(\frac{n_2}{n_1}\right)$
- 7) Dimensions of nanomaterials ranging from _____.
a) 1 to 100 nm
b) 2 to 5 nm
c) 100 to 150 nm
d) 0.1 to 5 nm

Seat No.	
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Set **Q**

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Day & Date: Saturday, 25-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Attempt any six of the following:

18

- Derive an expression for Fermi energy in intrinsic semiconductors $E_F = \frac{E_g}{2}$
- Define: valence band, conduction band and energy gap. Represent with neat diagram.
- Explain: Bragg's law
- Define co-ordination number. Obtain co-ordination number for SC and FCC.
- Explain:
 - Magnetostriction effect, and
 - Piezo-electric effect
- Write applications of Ultrasonic waves.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip. Calculate hall voltage that appears across the strip if number of charge carriers is $8.4 \times 10^{28} / \text{m}^3$
- Determine the lattice constant for FCC lead crystal of radius $1.746 \text{ \AA}$. Also find the spacing of,
 - (200) planes,
 - (111) planes

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the inter-planer spacing for (3 2 1) plane in a simple cube lattice where constant is $4.2 \text{ \AA}$.
 - A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

Section – II

Q.4 Attempt any SIX of the following.**18**

- a) Explain: Rayleigh's criterion of resolution.
- b) State and explain: Maudslaw's law.
- c) Explain:
 - i) Stimulated Emission and
 - ii) Spontaneous Emission
- d) State properties of LASER.
- e) Explain structure of optical fibers with neat labeled diagrams.
- f) Explain: Types of carbon nano tubes (CNTs).
- g) How many orders will be visible if the wavelength of the incident radiation is 6500 Å and the number of lines/cm on the grating is 5000.
- h) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.40 respectively.

Q.5 Attempt any TWO of the following:**10**

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$).
- c)
 - i) Calculate specific rotation, if the plane of polarization is rotated through 25° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
 - ii) Determine NA of a step index fibre when core refractive index $n_1 = 1.5$ and cladding refractive index $n_2 = 1.48$. Find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Max. Marks: 70

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- 1) In He-Ne lasers, the ratio of He-Ne is in the order _____.
a) 1:10
b) 10:1
c) 1:1
d) 100:1
- 2) Holography means _____.
a) To get zero dimension image
b) To get 2D image of 3D object
c) To get 3D image of 3D object
d) To get 3D image of 2D object
- 3) The critical angle Φ_c for fiber optics is _____.
a) $\sin\left(\frac{n_1}{n_2}\right)$
b) $\sin^{-1}\left(\frac{n_1}{n_2}\right)$
c) $\sin\left(\frac{n_2}{n_1}\right)$
d) $\sin^{-1}\left(\frac{n_2}{n_1}\right)$
- 4) Dimensions of nanomaterials ranging from _____.
a) 1 to 100 nm
b) 2 to 5 nm
c) 100 to 150 nm
d) 0.1 to 5 nm
- 5) Donor type semiconductor is formed by adding impurity of valency _____.
a) 3
b) 5
c) 4
d) 6
- 6) The band gap energy of silicon (Si) is approximately _____.
a) 0.3 eV
b) 1.1 eV
c) 0.7 eV
d) 2.1 eV
- 7) Total axes of symmetry for cubic structure is _____.
a) 3
b) 6
c) 9
d) 13

Seat No.	
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Set **R**

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Day & Date: Saturday, 25-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Attempt any six of the following:

18

- Derive an expression for Fermi energy in intrinsic semiconductors $E_F = \frac{E_g}{2}$
- Define: valence band, conduction band and energy gap. Represent with neat diagram.
- Explain: Bragg's law
- Define co-ordination number. Obtain co-ordination number for SC and FCC.
- Explain:
 - Magnetostriction effect, and
 - Piezo-electric effect
- Write applications of Ultrasonic waves.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip. Calculate hall voltage that appears across the strip if number of charge carriers is $8.4 \times 10^{28} / \text{m}^3$
- Determine the lattice constant for FCC lead crystal of radius $1.746 \text{ \AA}$. Also find the spacing of,
 - (200) planes,
 - (111) planes

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the inter-planer spacing for (3 2 1) plane in a simple cube lattice where constant is $4.2 \text{ \AA}$.
 - A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

Section – II

Q.4 Attempt any SIX of the following.**18**

- a) Explain: Rayleigh's criterion of resolution.
- b) State and explain: Maudslaw's law.
- c) Explain:
 - i) Stimulated Emission and
 - ii) Spontaneous Emission
- d) State properties of LASER.
- e) Explain structure of optical fibers with neat labeled diagrams.
- f) Explain: Types of carbon nano tubes (CNTs).
- g) How many orders will be visible if the wavelength of the incident radiation is 6500 Å and the number of lines/cm on the grating is 5000.
- h) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.40 respectively.

Q.5 Attempt any TWO of the following:**10**

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$).
- c)
 - i) Calculate specific rotation, if the plane of polarization is rotated through 25° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
 - ii) Determine NA of a step index fibre when core refractive index $n_1 = 1.5$ and cladding refractive index $n_2 = 1.48$. Find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

Seat No.	
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Day & Date: Saturday, 25-05-2024
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Marks: 14

14

- 1) Optimum reverberation time for speech is _____.
a) 0.5 to 1 sec b) 0.5 to 2 sec
c) 1 to 2 sec d) 2 to 3 sec
- 2) The sound waves with frequency less than 20 Hz are called _____.
a) audible waves b) infrasonic waves
c) ultrasonic waves d) Above all
- 3) Bending of the light at corners of slit and penetration of waves into the regions of geometrical shadow is known as _____.
a) polarization b) diffraction
c) dispersion d) interference
- 4) Along optic axis, the speed of o-ray and e-ray is _____.
a) $V_e = V_o$ b) $V_e > V_o$
c) $V_e < V_o$ d) None of these
- 5) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as _____.
a) depumping b) lasing action
c) population inversion d) pumping
- 6) In He-Ne lasers, the ratio of He-Ne is in the order _____.
a) 1:10 b) 10:1
c) 1:1 d) 100:1
- 7) Holography means _____.
a) To get zero dimension image b) To get 2D image of 3D object
c) To get 3D image of 3D object d) To get 3D image of 2D object

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Physics/(BTCE0101)/(BTCSE0101)/ (BTETE0101)/
(BTEE0101)/ (BTME0101)

Day & Date: Saturday, 25-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Attempt any six of the following:

18

- Derive an expression for Fermi energy in intrinsic semiconductors $E_F = \frac{E_g}{2}$
- Define: valence band, conduction band and energy gap. Represent with neat diagram.
- Explain: Bragg's law
- Define co-ordination number. Obtain co-ordination number for SC and FCC.
- Explain:
 - Magnetostriction effect, and
 - Piezo-electric effect
- Write applications of Ultrasonic waves.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B = 1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip. Calculate hall voltage that appears across the strip if number of charge carriers is $8.4 \times 10^{28} / \text{m}^3$
- Determine the lattice constant for FCC lead crystal of radius $1.746 \text{ \AA}$. Also find the spacing of,
 - (200) planes,
 - (111) planes

Q.3 Attempt any TWO of the following:

10

- What is Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the inter-planer spacing for (3 2 1) plane in a simple cube lattice where constant is $4.2 \text{ \AA}$.
 - A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

Section – II

Q.4 Attempt any SIX of the following.**18**

- a) Explain: Rayleigh's criterion of resolution.
- b) State and explain: Maudslaw's law.
- c) Explain:
 - i) Stimulated Emission and
 - ii) Spontaneous Emission
- d) State properties of LASER.
- e) Explain structure of optical fibers with neat labeled diagrams.
- f) Explain: Types of carbon nano tubes (CNTs).
- g) How many orders will be visible if the wavelength of the incident radiation is 6500 Å and the number of lines/cm on the grating is 5000.
- h) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.40 respectively.

Q.5 Attempt any TWO of the following:**10**

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$).
- c)
 - i) Calculate specific rotation, if the plane of polarization is rotated through 25° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
 - ii) Determine NA of a step index fibre when core refractive index $n_1 = 1.5$ and cladding refractive index $n_2 = 1.48$. Find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

SLR-JE-3

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Set	R
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F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination:
October/November – 2025

Engineering Physics

(BTCE0101/ BTCSE0101/ BTETE0101/ BTEE0101/ BTME0101/
BTECE0101/ BTMRE101/ BTAI0101/ BTMRE0101/ BTIT0101)

Day & Date: Friday, 19-12-2025

Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in Answer Book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicates full marks.
4) Make suitable assumptions if necessary and state them clearly.

- Constants:** 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks:14

Q.1 Choose the correct alternatives from the options.

14

- 1) LASER is a short form of _____.
 - a) Light Amplification by Stimulated Emission of Radiation
 - b) Light Absorption by Spontaneous Emission of Radiation
 - c) Light Amplification by Spontaneous Emission of Radiation
 - d) Light Absorption by Stimulated Emission of Radiation
- 2) The hologram records _____ of the object.
 - a) only phase distribution
 - b) both intensity variation and phase distribution
 - c) only intensity distribution
 - d) None of these
- 3) Basic principle of fiber is _____.
 - a) Reflection
 - b) Refraction
 - c) Total internal refraction
 - d) Total internal reflection
- 4) The chirality of helical CNT is _____.
 - a) $(a, 0)$
 - b) (a, a)
 - c) (a, b)
 - d) $(0, b)$

- 5) In N-type semiconductor, _____.
 a) number of holes are more than electrons
 b) number of electrons are more than holes
 c) number of holes and electrons are equal
 d) None of these
- 6) Hall voltage can be produced in metal/semiconductor material by _____.
 a) application of only magnetic field
 b) application of only electric field
 c) application of both magnetic and electric field
 d) None of these
- 7) The atomic radius of simple cube (SC) lattice is _____.
 a) $\frac{a}{4}$
 b) $\frac{\sqrt{2} \cdot a}{4}$
 c) $\frac{a}{2}$
 d) $\frac{\sqrt{3} \cdot a}{4}$
- 8) The void space for FCC structure is _____.
 a) 26%
 b) 33%
 c) 48%
 d) 52%
- 9) A plane parallel to one of the co-ordinate axes has an intercept of _____.
 a) 1
 b) $\frac{1}{2}$
 c) 0
 d) ∞
- 10) Reverberation time is _____ to the volume of the hall.
 a) independent
 b) directly proportional
 c) inversely proportional
 d) None of these
- 11) Ultrasonic waves have frequency _____.
 a) as that of audible range
 b) below audible range
 c) above audible range
 d) below as well as above audible range
- 12) Maximum number of orders possible with a grating is _____.
 a) independent of grating element
 b) directly proportional to wavelength
 c) directly proportional to grating element
 d) inversely proportional to grating element
- 13) The substance that rotates the plane of polarization are said to be _____.
 a) optically active
 b) optically inactive
 c) opaque
 d) polaroid
- 14) For population inversion _____.
 a) $N_1 \gg N_2$
 b) $N_1 = N_2$
 c) $N_2 \gg N_1$
 d) $N_2 = N_1$

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19 2568

Set R

F.Y. (B.Tech.) (Sem - I) (New) (NEP CBCS) Examination:
October/November – 2025

Engineering Physics

(BTCE0101/ BTCSE0101/ BTETE0101/ BTEE0101/ BTME0101/
BTECE0101/ BTMRE0101/ BTAI0101/ BTMRE0101/ BTIT0101)

Day & Date: Friday, 19-12-2025

Max. Marks: 56

Time: 10:00 AM To 01:00 PM

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Make suitable assumptions if necessary and state them clearly.

SECTION – I

Q.2 Attempt Any Six of the following.

18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Derive an expression for Fermi level lies at the centre of energy bandgap in intrinsic semiconductors.
- Calculate the atomic packing factor (APF) for SC, and BCC.
- Explain: Bragg's Law in X-ray diffraction.
- State and Explain Sabine Formula for the reverberation time.
- Write applications of ultrasonics in various fields.
- A current of 50 A is established in a slab of copper 0.5 cm thick and 2 cm wide. The slab is placed in a magnetic field (B) of 1.5T. The magnetic field is perpendicular to the plane of the slab and to the current. The free electron concentration in copper is 8.48×10^{28} electron/ m³. What will be the magnitude of Hall voltage across the width of the slab?
- Determine the Miller Indices of a plane which intercepts at a, b/2 and 3c in simple cubic unit cell.

Q.3 Attempt Any Two of the following.

10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.

- d) i) The atomic weight of silver is 108. It has a lattice constant of $4.077 \text{ \AA}$. Calculate the density of silver if it has FCC lattice structure.
- ii) The auditorium hall has dimensions $35 \times 20 \times 10 \text{ m}^3$. The reverberation time is 2.85 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

SECTION – II

Q.4 Attempt Any Six of the following.

18

- a) Explain: Positive and negative crystals.
- b) Explain: Rayleigh's criterion of resolution.
- c) Explain:
 - i) Stimulated Emission
 - ii) Spontaneous Emission
- d) State: Properties of LASER source.
- e) Explain: Types of optical fibers.
- f) Write: Applications of nanomaterials in various fields.
- g) A parallel beam of sodium light is allowed to be incident normally on a plane diffraction grating with 4280 lines per cm and a second order spectral line is observed to be deviated through 30° . Calculate the wavelength of spectral line.
- h) A glass clad fiber made with core glass of refractive index 1.555 and cladding is doped to a given index difference of 0.0005. Determine
 - i) cladding refractive index
 - ii) acceptance angle
 - iii) NA

Q.5 Attempt Any Two of the following.

10

- a) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- b) What is diffraction grating? Derive an expression $\lambda/d\lambda = n.N$ for the resolving power of a diffraction grating.
- c) i) Calculate specific rotation, if the plane of polarization is rotated through 25.45° . Length of tube is 20 cm. Given: concentration of sugar solution 20%.
- ii) Compute the numerical aperture of a step index fibre when core refractive index is 1.425 and cladding refractive index is 1.408. Also, find maximum angle for entrance of light if fibre is placed in air.
- d) Explain: He-Ne gas laser with neat energy and transition diagram.

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Day & Date: Wednesday, 26-07-2023
Time: 10:00 AM To 01:00 PM

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) Acceptor type semiconductor is formed by adding impurity of valency _____

a) 3 b) 4
c) 5 d) 2
- 2) The number of died axes symmetry elements that are present in a cubic crystal are _____

a) 4 b) 6
c) 8 d) 10
- 3) The Miller indices of the plane parallel to x & y axes are _____

a) (1 0 0) b) (0 1 0)
c) (0 0 1) d) (1 1 1)
- 4) The audible range of frequency is _____

a) 20 KHz to 20 MHz b) 200 KHz to 200 MHz
c) 200 Hz to 200 MHz d) 20 Hz to 20 KHz
- 5) Reverberation time is _____ to/of volume of the hall.

a) directly proportional b) inversely proportional
c) Independent d) none of these
- 6) The non-inertial frame of reference is _____ frame of reference

a) Non-accelerated b) An accelerated
c) A rotating d) None of these
- 7) The Lorentz transformation equation for x' co-ordinate from s to s' _____

a) $x' = (x + vt)\sqrt{1 - v^2/c^2}$ b) $x' = (x - ct)/\sqrt{1 - v^2/c^2}$
c) $x' = (x - vt)/\sqrt{(1 - v^2/c^2)}$ d) $x' = x - vt (\sqrt{1 - v^2/c^2})$

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Set **P**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicates full marks.
 3) Make suitable assumptions, if necessary.

Section – I**Q.2 Attempt any SIX of the following.****18**

- Prove that Fermi level in an intrinsic semiconductor lies half way between a valence band & conduction band.
- Explain in detail Bragg's law.
- What are the acoustic requirements of a good auditorium?
- What is piezo-electric effect & magneto-striction effect?
- Derive the expression of length contraction.
- Derive Einstein's expression for mass-energy equivalence.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B=1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip, calculate hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7} \text{ m}^3/\text{C}$
- Calculate the interplaner spacing for (2 1 2) plane in a simple cube lattice where lattice constant is $4.6 \text{ \AA}$.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplaner spacing for cubic crystal.
- For an empty assembly hall of size $20 \times 15 \times 10 \text{ m}^3$ the reverberation time is 3.5 s, calculate the average absorption coefficient of the hall. What are of the wall should be covered by the curtain so as to reduce the reverberation time to 2.5 s. Given the absorption coefficient of curtain cloth is 0.5.
- Derive the expression for Lorentz transformation equations & its inverse.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Explain Rayleigh's criterion of resolution.
- Define
 - Spontaneous emission
 - Stimulated emission
 - Stimulated absorption
- Explain construction and reconstruction of hologram with neat diagram.
- Write a note on: Classification of optical fibers.
- State properties of matter waves.

- f) Write applications of nanotechnology.
- g) A grating has 100 lines ruled on it. What is the difference between two wavelength that just appear separated in the second order spectrum in the region $\lambda = 6 \times 10^{-5} \text{ cm}$.
- h) What is the numerical aperture and fractional refractive index change of an optical fiber cable with cladding index of 1.378 and a core index of 1.546.

Q.5 Attempt any TWO of the following.**10**

- a) With neat diagram explain construction and working of Laurent's half shade polarimeter.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Find the velocity and kinetic energy of a neutron with a De Broglie wavelength of 0.30 nm. Given $h=6.634 \times 10^{-34} \text{ J.s}$ and $m=1.67 \times 10^{-27} \text{ kg}$

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Day & Date: Wednesday, 26-07-2023
Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.

- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
3) Figures to the right indicate full marks.
4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26} / \text{k.mol.}$

- 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

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Seat No.	
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Set **Q**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicates full marks.
 3) Make suitable assumptions, if necessary.

Section – I**Q.2 Attempt any SIX of the following.****18**

- Prove that Fermi level in an intrinsic semiconductor lies half way between a valence band & conduction band.
- Explain in detail Bragg's law.
- What are the acoustic requirements of a good auditorium?
- What is piezo-electric effect & magneto-striction effect?
- Derive the expression of length contraction.
- Derive Einstein's expression for mass-energy equivalence.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B=1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip, calculate hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7} \text{ m}^3/\text{C}$
- Calculate the interplaner spacing for (2 1 2) plane in a simple cube lattice where lattice constant is $4.6 \text{ \AA}$.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplaner spacing for cubic crystal.
- For an empty assembly hall of size $20 \times 15 \times 10 \text{ m}^3$ the reverberation time is 3.5 s, calculate the average absorption coefficient of the hall. What are of the wall should be covered by the curtain so as to reduce the reverberation time to 2.5 s. Given the absorption coefficient of curtain cloth is 0.5.
- Derive the expression for Lorentz transformation equations & its inverse.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Explain Rayleigh's criterion of resolution.
- Define
 - Spontaneous emission
 - Stimulated emission
 - Stimulated absorption
- Explain construction and reconstruction of hologram with neat diagram.
- Write a note on: Classification of optical fibers.
- State properties of matter waves.

- f) Write applications of nanotechnology.
- g) A grating has 100 lines ruled on it. What is the difference between two wavelength that just appear separated in the second order spectrum in the region $\lambda = 6 \times 10^{-5} \text{ cm}$.
- h) What is the numerical aperture and fractional refractive index change of an optical fiber cable with cladding index of 1.378 and a core index of 1.546.

Q.5 Attempt any TWO of the following.**10**

- a) With neat diagram explain construction and working of Laurent's half shade polarimeter.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Find the velocity and kinetic energy of a neutron with a De Broglie wavelength of 0.30 nm. Given $h=6.634 \times 10^{-34} \text{ J.s}$ and $m=1.67 \times 10^{-27} \text{ kg}$

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Set **R**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.

2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.

3) Figures to the right indicate full marks.

4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.

2) Velocity of light, $c = 3 \times 10^8$ m/sec.

3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) The hologram records _____ of the object.
 - a) Both intensity variation & phase distribution
 - b) Only phase distribution
 - c) Only intensity variation
 - d) None of these
- 2) In total internal reflection phenomenon, the light ray incident from _____.
 - a) Rarer to denser
 - b) Rarer to rarer
 - c) Denser to denser
 - d) Denser to rarer
- 3) The numerical aperture is given by the equation _____.
 - a) $NA = \sqrt{(n_1^2 + n_2^2)}$
 - b) $NA = \sqrt{(n_1^2 - n_2^2)}$
 - c) $NA = \sqrt{(n_1^2 - n_2^2)}$
 - d) $NA = \sqrt{(n_2^2 - n_1^2)}$
- 4) The chirality of zigzag CNT is _____.
 - a) (a, b)
 - b) (a, 0)
 - c) (a, a)
 - d) (0, b)
- 5) Acceptor type semiconductor is formed by adding impurity of valency _____.
 - a) 3
 - b) 4
 - c) 5
 - d) 2
- 6) The number of died axes symmetry elements that are present in a cubic crystal are _____.
 - a) 4
 - b) 6
 - c) 8
 - d) 10
- 7) The Miller indices of the plane parallel to x & y axes are _____.
 - a) (1 0 0)
 - b) (0 1 0)
 - c) (0 0 1)
 - d) (1 1 1)
- 8) The audible range of frequency is _____.
 - a) 20 KHz to 20 MHz
 - b) 200 KHz to 200 MHz
 - c) 200 Hz to 200 MHz
 - d) 20 Hz to 20 KHz

- 9) Reverberation time is _____ to/of volume of the hall.
a) directly proportional b) inversely proportional
c) Independent d) none of these
- 10) The non-inertial frame of reference is _____ frame of reference
a) Non-accelerated b) An accelerated
c) A rotating d) None of these
- 11) The Lorentz transformation equation for x' co-ordinate from s to s' _____
a) $x' = (x + vt) \sqrt{1 - v^2/c^2}$ b) $x' = (x - ct)/1 - v^2/c^2$
c) $x' = (x - vt) / \sqrt{(1 - v^2/c^2)}$ d) $x' = x - vt (\sqrt{1 - v^2/c^2})$
- 12) The resolving power of a grating having N slits in n^{th} order will be _____.
a) $(n + N)$ b) $(n - N)$
c) n/N d) $n \cdot N$
- 13) The substances that rotate the plane of polarization are said to be _____.
a) opaque b) optically inactive
c) optically active d) Polaroid
- 14) Stimulated emission process is represented by equation _____
a) $A + h\nu \rightarrow A^*$ b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A^* \rightarrow A + h\nu$ d) $A^* + h\nu \rightarrow A + h\nu$

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Set **R**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicates full marks.
 3) Make suitable assumptions, if necessary.

Section – I**Q.2 Attempt any SIX of the following.****18**

- Prove that Fermi level in an intrinsic semiconductor lies half way between a valence band & conduction band.
- Explain in detail Bragg's law.
- What are the acoustic requirements of a good auditorium?
- What is piezo-electric effect & magneto-striction effect?
- Derive the expression of length contraction.
- Derive Einstein's expression for mass-energy equivalence.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B=1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip, calculate hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7} \text{ m}^3/\text{C}$
- Calculate the interplaner spacing for (2 1 2) plane in a simple cube lattice where lattice constant is $4.6 \text{ \AA}$.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplaner spacing for cubic crystal.
- For an empty assembly hall of size $20 \times 15 \times 10 \text{ m}^3$ the reverberation time is 3.5 s, calculate the average absorption coefficient of the hall. What are of the wall should be covered by the curtain so as to reduce the reverberation time to 2.5 s. Given the absorption coefficient of curtain cloth is 0.5.
- Derive the expression for Lorentz transformation equations & its inverse.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Explain Rayleigh's criterion of resolution.
- Define
 - Spontaneous emission
 - Stimulated emission
 - Stimulated absorption
- Explain construction and reconstruction of hologram with neat diagram.
- Write a note on: Classification of optical fibers.
- State properties of matter waves.

- f) Write applications of nanotechnology.
- g) A grating has 100 lines ruled on it. What is the difference between two wavelength that just appear separated in the second order spectrum in the region $\lambda = 6 \times 10^{-5} \text{ cm}$.
- h) What is the numerical aperture and fractional refractive index change of an optical fiber cable with cladding index of 1.378 and a core index of 1.546.

Q.5 Attempt any TWO of the following.**10**

- a) With neat diagram explain construction and working of Laurent's half shade polarimeter.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Find the velocity and kinetic energy of a neutron with a De Broglie wavelength of 0.30 nm. Given $h=6.634 \times 10^{-34} \text{ J.s}$ and $m=1.67 \times 10^{-27} \text{ kg}$

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Set **S**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.

2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.

3) Figures to the right indicate full marks.

4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.

2) Velocity of light, $c = 3 \times 10^8$ m/sec.

3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) The non-inertial frame of reference is _____ frame of reference
 - a) Non-accelerated
 - b) An accelerated
 - c) A rotating
 - d) None of these
- 2) The Lorentz transformation equation for x' co-ordinate from s to s' _____
 - a) $x' = (x + vt) \sqrt{1 - v^2/c^2}$
 - b) $x' = (x - ct) / \sqrt{1 - v^2/c^2}$
 - c) $x' = (x - vt) / \sqrt{(1 - v^2/c^2)}$
 - d) $x' = x - vt (\sqrt{1 - v^2/c^2})$
- 3) The resolving power of a grating having N slits in n^{th} order will be _____.
 - a) $(n + N)$
 - b) $(n - N)$
 - c) n/N
 - d) $n \cdot N$
- 4) The substances that rotate the plane of polarization are said to be _____.
 - a) opaque
 - b) optically inactive
 - c) optically active
 - d) Polaroid
- 5) Stimulated emission process is represented by equation _____.
 - a) $A + h\nu \rightarrow A^*$
 - b) $A^* + h\nu \rightarrow A + 2h\nu$
 - c) $A^* \rightarrow A + h\nu$
 - d) $A^* + h\nu \rightarrow A + h\nu$
- 6) The hologram records _____ of the object.
 - a) Both intensity variation & phase distribution
 - b) Only phase distribution
 - c) Only intensity variation
 - d) None of these
- 7) In total internal reflection phenomenon, the light ray incident from _____.
 - a) Rarer to denser
 - b) Rarer to rarer
 - c) Denser to denser
 - d) Denser to rarer
- 8) The numerical aperture is given by the equation _____.
 - a) $NA = \sqrt{(n_1^2 + n_2^2)}$
 - b) $NA = (n_1^2 - n_2^2)$
 - c) $NA = \sqrt{(n_1^2 - n_2^2)}$
 - d) $NA = \sqrt{(n_2^2 - n_1^2)}$

- 9) The chirality of zigzag CNT is _____.
a) (a, b) b) (a, 0)
c) (a, a) d) (0, b)
- 10) Acceptor type semiconductor is formed by adding impurity of valency _____.
a) 3 b) 4
c) 5 d) 2
- 11) The number of died axes symmetry elements that are present in a cubic crystal are _____.
a) 4 b) 6
c) 8 d) 10
- 12) The Miller indices of the plane parallel to x & y axes are _____.
a) (1 0 0) b) (0 1 0)
c) (0 0 1) d) (1 1 1)
- 13) The audible range of frequency is _____.
a) 20 KHz to 20 MHz b) 200 KHz to 200 MHz
c) 200 Hz to 200 MHz d) 20 Hz to 20 KHz
- 14) Reverberation time is _____ to/of volume of the hall.
a) directly proportional b) inversely proportional
c) Independent d) none of these

Seat No.	
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Set **S**

F.Y. (B.Tech.) (Sem - II) (CBCS) Examination: March/April-2023
ENGINEERING PHYSICS (BTN10201)

Day & Date: Wednesday, 26-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicates full marks.
 3) Make suitable assumptions, if necessary.

Section – I**Q.2 Attempt any SIX of the following.****18**

- Prove that Fermi level in an intrinsic semiconductor lies half way between a valence band & conduction band.
- Explain in detail Bragg's law.
- What are the acoustic requirements of a good auditorium?
- What is piezo-electric effect & magneto-striction effect?
- Derive the expression of length contraction.
- Derive Einstein's expression for mass-energy equivalence.
- A copper strip 2 cm wide and 1mm thick is placed in a magnetic field with $B=1.5 \text{ wb/m}^2$. If a current of 200 A is set up in the strip, calculate hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7} \text{ m}^3/\text{C}$
- Calculate the interplaner spacing for (2 1 2) plane in a simple cube lattice where lattice constant is $4.6 \text{ \AA}$.

Q.3 Attempt any TWO of the following:**10**

- What is Hall effect? Derive the relation for Hall voltage and Hall coefficient.
- Explain the term Miller indices. Derive the relation between lattice constant & interplaner spacing for cubic crystal.
- For an empty assembly hall of size $20 \times 15 \times 10 \text{ m}^3$ the reverberation time is 3.5 s, calculate the average absorption coefficient of the hall. What are of the wall should be covered by the curtain so as to reduce the reverberation time to 2.5 s. Given the absorption coefficient of curtain cloth is 0.5.
- Derive the expression for Lorentz transformation equations & its inverse.

Section – II**Q.4 Attempt any SIX of the following:****18**

- Explain Rayleigh's criterion of resolution.
- Define
 - Spontaneous emission
 - Stimulated emission
 - Stimulated absorption
- Explain construction and reconstruction of hologram with neat diagram.
- Write a note on: Classification of optical fibers.
- State properties of matter waves.

- f) Write applications of nanotechnology.
- g) A grating has 100 lines ruled on it. What is the difference between two wavelength that just appear separated in the second order spectrum in the region $\lambda = 6 \times 10^{-5} \text{ cm}$.
- h) What is the numerical aperture and fractional refractive index change of an optical fiber cable with cladding index of 1.378 and a core index of 1.546.

Q.5 Attempt any TWO of the following.**10**

- a) With neat diagram explain construction and working of Laurent's half shade polarimeter.
- b) Describe He-Ne laser with its construction and working.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d) Find the velocity and kinetic energy of a neutron with a De Broglie wavelength of 0.30 nm. Given $h=6.634 \times 10^{-34} \text{ J.s}$ and $m=1.67 \times 10^{-27} \text{ kg}$

F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov - 2023
Engineering Physics (BTCE0101) / (BTCSE0101) /
(BTETE0101) / (BTEE0101) / (BTME0101)

Max. Marks: 70

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Marks: 14

14

- 1) The band gap energy of Ge is approximately _____.
a) 0.3 eV b) 1.1 eV
c) 0.7 eV d) 2.5 eV
- 2) The mobility (μ) is given by _____.
a) $\mu = \rho \cdot R_H$ b) $\mu = \rho / R_H$
c) $\mu = \sigma \cdot R_H$ d) $\mu = \sigma / R_H$
- 3) The atomic radius of BCC lattice is _____.
a) $\frac{\sqrt{2}}{4} \cdot a$ b) $\frac{\sqrt{3}}{4} \cdot a$
c) $\frac{a}{2}$ d) $\frac{a}{4}$
- 4) The co-ordination number in case of BCC structure is _____.
a) 6 b) 12
c) 8 d) 10
- 5) The no. of atoms in a unit cell of FCC structure is _____.
a) 1 b) 3
c) 2 d) 4
- 6) Optimum reverberation time for music is _____.
a) 0.5 to 1 sec b) 0 to 1 sec
c) 1 to 2 sec d) above 5 sec
- 7) The sound waves with frequency greater than 20 kHz are called _____.
a) audible waves b) infrasonic waves
c) ultrasonic waves d) Above all
- 8) Light waves are transverse in nature, can be demonstrated by observing the phenomenon of _____.
a) polarization b) diffraction
c) dispersion d) interference

- 9) The wave front corresponding to 0- ray is ____.

a) Cylindrical b) Elliptical

c) Plane d) Spherical
- 10) Emission of a photon by an atom without an external impetus (agency) is called ____.

a) stimulated emission b) induced emission

c) amplified emission d) spontaneous emission
- 11) Stimulated absorption process is mathematically represented by equation ____.

a) $A + h\nu \rightarrow A^*$ b) $A^* + h\nu \rightarrow A + 2h\nu$

c) $A^* \rightarrow A + h\nu$ d) $A^* + h\nu \rightarrow A + h\nu$
- 12) The hologram records _____ of the object.

a) Both intensity variation and phase distribution

b) Only intensity variation

c) Only phase distribution

d) None
- 13) Basic principle of fiber is ____.

a) total internal reflection b) refraction

c) reflection d) total internal refraction
- 14) The chirality of zigzag CNT is ____.

a) (a, a) b) (a, b)

c) $(0, b)$ d) $(a, 0)$

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov - 2023
Engineering Physics (BTCE0101) / (BTCSE0101) /
(BTETE0101) / (BTEE0101) / (BTME0101)

Day & Date: Sunday, 07-01-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any Six.

18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Represent with diagrams the position of Fermi level in,
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC and BCC.
- Define void space and obtain the values for SC, BCC and FCC structure.
- State: Properties of ultrasonic waves.
- What are the basic acoustic requirements of a good auditorium?
- A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m^2 applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be $37 \mu\text{V}$. What is the Hall coefficient of this semiconductor?
- Lead is FCC with an atomic radius of $r = 1.746 \text{ \AA}$. Find the spacing of:
 - (200) planes
 - (220) planes

Q.3 Attempt any two.

10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the interplanar spacing (201) planes in a cubic crystal of lattice constant $4.3 \times 10^{-8} \text{ cm}$.
 - The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.

Section – II

Q.4 Attempt any six.

18

- a) Explain: Positive and negative crystals.
- b) Explain: Rayleigh's criterion of resolution.
- c) Explain:
 - i) Population Inversion
 - ii) Stimulated Emission
- d) State properties of LASER.
- e) Explain three types of optical fiber with diagram.
- f) Write applications of nanotechnology in various fields.
- g) What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000 Å by means of diffraction grating with 5000 lines per cm.
- h) The numerical aperture of an optical fibre is 0.5 and the core refractive index is 1.5. Find refractive index of the cladding.

Q.5 Attempt any Two.

10

- a) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$)
- b) Explain: He-Ne gas laser with neat energy and transition diagram.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d)
 - i) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° , calculate the strength of the solution.
 - ii) In a step index optical fibre, core index $n_1 = 1.55$ and cladding index $n_2 = 1.40$. Find
 - i) NA
 - ii) Δ
 - iii) Acceptance angle

Seat No.	
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Day & Date: Sunday, 07-01-2024
Time: 03:00 PM To 06:00 PM

Max. Marks: 70

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- Light waves are transverse in nature, can be demonstrated by observing the phenomenon of _____.
 - polarization
 - diffraction
 - dispersion
 - interference
- The wave front corresponding to 0- ray is _____.
 - Cylindrical
 - Elliptical
 - Plane
 - Spherical
- Emission of a photon by an atom without an external impetus (agency) is called _____.
 - stimulated emission
 - induced emission
 - amplified emission
 - spontaneous emission
- Stimulated absorption process is mathematically represented by equation _____.
 - $A + h\nu \rightarrow A^*$
 - $A^* + h\nu \rightarrow A + 2h\nu$
 - $A^* \rightarrow A + h\nu$
 - $A^* + h\nu \rightarrow A + h\nu$
- The hologram records _____ of the object.
 - Both intensity variation and phase distribution
 - Only intensity variation
 - Only phase distribution
 - None
- Basic principle of fiber is _____.
 - total internal reflection
 - refraction
 - reflection
 - total internal refraction
- The chirality of zigzag CNT is _____.
 - (a, a)
 - (a, b)
 - $(0, b)$
 - $(a, 0)$

- 8) The band gap energy of Ge is approximately _____.
a) 0.3 eV b) 1.1 eV
c) 0.7 eV d) 2.5 eV
- 9) The mobility (μ) is given by _____.
a) $\mu = \rho \cdot R_H$ b) $\mu = \rho / R_H$
c) $\mu = \sigma \cdot R_H$ d) $\mu = \sigma / R_H$
- 10) The atomic radius of BCC lattice is _____.
a) $\frac{\sqrt{2}}{4} \cdot a$ b) $\frac{\sqrt{3}}{4} \cdot a$
c) $\frac{a}{2}$ d) $\frac{a}{4}$
- 11) The co-ordination number in case of BCC structure is _____.
a) 6 b) 12
c) 8 d) 10
- 12) The no. of atoms in a unit cell of FCC structure is _____.
a) 1 b) 3
c) 2 d) 4
- 13) Optimum reverberation time for music is _____.
a) 0.5 to 1 sec b) 0 to 1 sec
c) 1 to 2 sec d) above 5 sec
- 14) The sound waves with frequency greater than 20 kHz are called _____.
a) audible waves b) infrasonic waves
c) ultrasonic waves d) Above all

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov - 2023
Engineering Physics (BTCE0101) / (BTCSE0101) /
(BTETE0101) / (BTEE0101) / (BTME0101)

Day & Date: Sunday, 07-01-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 56

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any Six.

18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Represent with diagrams the position of Fermi level in,
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC and BCC.
- Define void space and obtain the values for SC, BCC and FCC structure.
- State: Properties of ultrasonic waves.
- What are the basic acoustic requirements of a good auditorium?
- A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m^2 applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be $37 \mu\text{V}$. What is the Hall coefficient of this semiconductor?
- Lead is FCC with an atomic radius of $r = 1.746 \text{ \AA}$. Find the spacing of:
 - (200) planes
 - (220) planes

Q.3 Attempt any two.

10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the interplanar spacing (201) planes in a cubic crystal of lattice constant $4.3 \times 10^{-8} \text{ cm}$.
 - The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.

Section – II

Q.4 Attempt any six.

18

- a) Explain: Positive and negative crystals.
- b) Explain: Rayleigh's criterion of resolution.
- c) Explain:
 - i) Population Inversion
 - ii) Stimulated Emission
- d) State properties of LASER.
- e) Explain three types of optical fiber with diagram.
- f) Write applications of nanotechnology in various fields.
- g) What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000 Å by means of diffraction grating with 5000 lines per cm.
- h) The numerical aperture of an optical fibre is 0.5 and the core refractive index is 1.5. Find refractive index of the cladding.

Q.5 Attempt any Two.

10

- a) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$)
- b) Explain: He-Ne gas laser with neat energy and transition diagram.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d)
 - i) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° , calculate the strength of the solution.
 - ii) In a step index optical fibre, core index $n_1 = 1.55$ and cladding index $n_2 = 1.40$. Find
 - i) NA
 - ii) Δ
 - iii) Acceptance angle

Seat
No.

Set R

Day & Date: Sunday, 07-01-2024
Time: 03:00 PM To 06:00 PM

Max. Marks: 70

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions, if necessary.

Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- 1) Stimulated absorption process is mathematically represented by equation _____.
a) $A + h\nu \rightarrow A^*$ b) $A^* + h\nu \rightarrow A + 2h\nu$
c) $A^* \rightarrow A + h\nu$ d) $A^* + h\nu \rightarrow A + h\nu$
- 2) The hologram records _____ of the object.
a) Both intensity variation and phase distribution
b) Only intensity variation
c) Only phase distribution
d) None
- 3) Basic principle of fiber is _____.
a) total internal reflection b) refraction
c) reflection d) total internal refraction
- 4) The chirality of zigzag CNT is _____.
a) (a, a) b) (a, b)
c) $(0, b)$ d) $(a, 0)$
- 5) The band gap energy of Ge is approximately _____.
a) 0.3 eV b) 1.1 eV
c) 0.7 eV d) 2.5 eV
- 6) The mobility (μ) is given by _____.
a) $\mu = \rho \cdot R_H$ b) $\mu = \rho / R_H$
c) $\mu = \sigma \cdot R_H$ d) $\mu = \sigma / R_H$
- 7) The atomic radius of BCC lattice is _____.
a) $\frac{\sqrt{2}}{4} \cdot a$ b) $\frac{\sqrt{3}}{4} a$
c) $\frac{a}{2}$ d) $\frac{a}{\sqrt{2}}$

- 8) The co-ordination number in case of BCC structure is _____.
a) 6
b) 12
c) 8
d) 10
- 9) The no. of atoms in a unit cell of FCC structure is _____.
a) 1
b) 3
c) 2
d) 4
- 10) Optimum reverberation time for music is _____.
a) 0.5 to 1 sec
b) 0 to 1 sec
c) 1 to 2 sec
d) above 5 sec
- 11) The sound waves with frequency greater than 20 kHz are called _____.
a) audible waves
b) infrasonic waves
c) ultrasonic waves
d) Above all
- 12) Light waves are transverse in nature, can be demonstrated by observing the phenomenon of _____.
a) polarization
b) diffraction
c) dispersion
d) interference
- 13) The wave front corresponding to α -ray is _____.
a) Cylindrical
b) Elliptical
c) Plane
d) Spherical
- 14) Emission of a photon by an atom without an external impetus (agency) is called _____.
a) stimulated emission
b) induced emission
c) amplified emission
d) spontaneous emission

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov - 2023
Engineering Physics (BTCE0101) / (BTCSE0101) /
(BTETE0101) / (BTEE0101) / (BTME0101)

Day & Date: Sunday, 07-01-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any Six.

18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Represent with diagrams the position of Fermi level in,
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC and BCC.
- Define void space and obtain the values for SC, BCC and FCC structure.
- State: Properties of ultrasonic waves.
- What are the basic acoustic requirements of a good auditorium?
- A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m^2 applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be $37 \mu\text{V}$. What is the Hall coefficient of this semiconductor?
- Lead is FCC with an atomic radius of $r = 1.746 \text{ \AA}$. Find the spacing of:
 - (200) planes
 - (220) planes

Q.3 Attempt any two.

10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the interplanar spacing (201) planes in a cubic crystal of lattice constant $4.3 \times 10^{-8} \text{ cm}$.
 - The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.

Section – II

Q.4 Attempt any six.

18

- a) Explain: Positive and negative crystals.
- b) Explain: Rayleigh's criterion of resolution.
- c) Explain:
 - i) Population Inversion
 - ii) Stimulated Emission
- d) State properties of LASER.
- e) Explain three types of optical fiber with diagram.
- f) Write applications of nanotechnology in various fields.
- g) What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000 Å by means of diffraction grating with 5000 lines per cm.
- h) The numerical aperture of an optical fibre is 0.5 and the core refractive index is 1.5. Find refractive index of the cladding.

Q.5 Attempt any Two.

10

- a) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$)
- b) Explain: He-Ne gas laser with neat energy and transition diagram.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d)
 - i) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° , calculate the strength of the solution.
 - ii) In a step index optical fibre, core index $n_1 = 1.55$ and cladding index $n_2 = 1.40$. Find
 - i) NA
 - ii) Δ
 - iii) Acceptance angle

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Day & Date: Sunday, 07-01-2024
Time: 03:00 PM To 06:00 PM

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
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Constants: 1) Avogadro's no., $N = 6.02 \times 10^{26}$ / k.mol.
2) Velocity of light, $c = 3 \times 10^8$ m/sec.
3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct option from the following.

14

- Page 13 of 16

- 8) Basic principle of fiber is _____.
a) total internal reflection b) refraction
c) reflection d) total internal refraction
- 9) The chirality of zigzag CNT is _____.
a) (a, a) b) (a, b)
c) $(0, b)$ d) $(a, 0)$
- 10) The band gap energy of Ge is approximately _____.
a) 0.3 eV b) 1.1 eV
c) 0.7 eV d) 2.5 eV
- 11) The mobility (μ) is given by _____.
a) $\mu = \rho \cdot R_H$ b) $\mu = \rho / R_H$
c) $\mu = \sigma \cdot R_H$ d) $\mu = \sigma / R_H$
- 12) The atomic radius of BCC lattice is _____.
a) $\frac{\sqrt{2}}{4} \cdot a$ b) $\frac{\sqrt{3}}{4} \cdot a$
c) $\frac{a}{2}$ d) $\frac{a}{4}$
- 13) The co-ordination number in case of BCC structure is _____.
a) 6 b) 12
c) 8 d) 10
- 14) The no. of atoms in a unit cell of FCC structure is _____.
a) 1 b) 3
c) 2 d) 4

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov - 2023
Engineering Physics (BTCE0101) / (BTCSE0101) /
(BTETE0101) / (BTEE0101) / (BTME0101)

Day & Date: Sunday, 07-01-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 56

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data if necessary.

Section – I

Q.2 Attempt any Six.

18

- Classify: insulator, semiconductor and conductor on the basis of energy band structure.
- Represent with diagrams the position of Fermi level in,
 - P-type
 - N-type semiconductors
- Define atomic radius and obtain its values for SC and BCC.
- Define void space and obtain the values for SC, BCC and FCC structure.
- State: Properties of ultrasonic waves.
- What are the basic acoustic requirements of a good auditorium?
- A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m^2 applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be $37 \mu\text{V}$. What is the Hall coefficient of this semiconductor?
- Lead is FCC with an atomic radius of $r = 1.746 \text{ \AA}$. Find the spacing of:
 - (200) planes
 - (220) planes

Q.3 Attempt any two.

10

- State Hall effect? Derive the relation for Hall voltage (V_H) and Hall coefficient (R_H).
- Explain the term Miller indices. Derive the relation between lattice constant and interplanar spacing for cubic crystal.

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

- State and explain the factors affecting the architectural acoustics and their remedies.
- Calculate the interplanar spacing (201) planes in a cubic crystal of lattice constant $4.3 \times 10^{-8} \text{ cm}$.
 - The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.

Section – II

Q.4 Attempt any six.

18

- a) Explain: Positive and negative crystals.
- b) Explain: Rayleigh's criterion of resolution.
- c) Explain:
 - i) Population Inversion
 - ii) Stimulated Emission
- d) State properties of LASER.
- e) Explain three types of optical fiber with diagram.
- f) Write applications of nanotechnology in various fields.
- g) What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000 Å by means of diffraction grating with 5000 lines per cm.
- h) The numerical aperture of an optical fibre is 0.5 and the core refractive index is 1.5. Find refractive index of the cladding.

Q.5 Attempt any Two.

10

- a) What is diffraction grating? Derive an expression for the resolving power of a diffraction grating ($\lambda/d\lambda = n.N$)
- b) Explain: He-Ne gas laser with neat energy and transition diagram.
- c) Obtain the expression for acceptance angle, acceptance cone, numerical aperture and fractional refractive index change of an optical fiber.
- d)
 - i) A 20 cm long glass tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66° , calculate the strength of the solution.
 - ii) In a step index optical fibre, core index $n_1 = 1.55$ and cladding index $n_2 = 1.40$. Find
 - i) NA
 - ii) Δ
 - iii) Acceptance angle