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**Printed Page:-4** **Subject Code:- CAS0101B**

**Roll. No:**

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**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA**
**(An Autonomous Institute Affiliated to AKTU, Lucknow)**
**B.Tech**
**SEM: I - THEORY EXAMINATION (2025 - 2026)**
**Subject: Engineering Physics**

**Time: 3 Hours** **Max. Marks: 100**

**General Instructions:**

**IMP:** *Verify that you have received the question paper with the correct course, code, branch etc.*

***1.*** *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

***2.*** *Maximum marks for each question are indicated on right -hand side of each question.*

***3.*** *Illustrate your answers with neat sketches wherever necessary.*

***4.*** *Assume suitable data if necessary.*

***5.*** *Preferably, write the answers in sequential order.*

***6.*** *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*



**SECTION-A** 20

1. Attempt all parts:-

1-a. Least count of an measuring instrument refers to: (CO1, K2) 1

(a) Maximum measurement
(b) Minimum reading
(c) Smallest measurable value
(d) Zero value

1-b. Calibration eliminates which type of error: (CO1, K2) 1

(a) Random errors
(b) Systematic errors
(c) Gross errors
(d) Parallax errors

1-c. Relative motion is best analyzed using: (CO2, K2) 1

(a) absolute reference frame
(b) moving coordinate system
(c) inertial frame
(d) non-inertial frame

1-d. Rotational analogue of mass is: (CO2, K2) 1

(a) torque
(b) angular velocity
(c) moment of inertia
(d) angular momentum

1-e. In isothermal process internal energy of the system (CO3, K2) 1

(a) Increases rapidly
(b) remains constant
(c) decreases rapidly
(d) none

1-f. When the system is in equilibrium with the surroundings, it must be in (CO3, K2) 1

(a) pressure equilibrium
(b) temperature equilibrium
(c) chemical equilibrium
(d) All of the Above

1-g. Bravais lattice consists of _____ space lattices. (CO4, K1) 1

(a) Eleven
(b) Twelve
(c) Thirteen
(d) Fourteen

1-h. X-ray diffraction occurs in crystals because the wavelength of X-rays is of the order of (CO4, K2) 1

(a) atomic radius
(b) inter-atomic spacing
(c) lattice constant squared
(d) nuclear dimensions

1-i. The property of the cell membrane that allows it to regulate the movement of substances in and out of the cell is called: (CO5, K2) 1

(a) Permeability
(b) Impermeability
(c) Selective permeability
(d) None

1-j. Electrical bioinstrumentation is primarily based on measuring: (CO5, K1) 1

(a) Temperature changes
(b) Electrical activity from biological sources
(c) Pressure fluctuations
(d) Optical signals

2. Attempt all parts:-

2.a. What is uncertainty in measurement? (CO1, K1) 2

2.b. What is relative motion? Give an example. (CO2, K1) 2

2.c. State the Kelvin- Planck statement of the second law. (CO3, K2) 2

2.d. Define atomic packing factor. (CO4, K1) 2

2.e. How many types of molecular forces are there in biological molecules? (CO5, K1) 2

**SECTION-B** 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

| | | |
|---|---|---|
| 3.a.(i) | A voltage is measured four times as: 270 V, 269 V, 271 V, 268 V. Calculate mean voltage, absolute errors and percentage error from mean. Consider actual voltage to be 270V. (CO1, K3) | 6 |
| 3.a.(ii) | A thermometer has accuracy ±0.5% of reading. It shows 75°C. Find actual temperature range. (CO1, K3) | 6 |
| 3.b. Answer any one of the following:- | | |
| 3.b.(i) | A car moves 100 m east and then 60 m west. Find the distance and displacement with direction. (CO2, K3) | 6 |
| 3.b.(ii) | A hollow cylinder of mass 5 Kg having radius 0.10 m rolling without slipping with linear speed 2 m/s. Find rotational kinetic energy of the cylinder. (CO2, K3) | 6 |
| 3.c. Answer any one of the following:- | | |
| 3.c.(i) | A heat engine has an efficiency of 30%. If it absorbs 1200 J of heat, find (a) work done and (b) heat rejected. (CO3, K3) | 6 |
| 3.c.(ii) | Find the thermal efficiency of a Carnot engine whose hot and cold bodies have temperatures of 154℃ and 15℃ respectively? (CO3, K3) | 6 |
| 3.d. Answer any one of the following:- | | |
| 3.d.(i) | Calculate the interplanar spacing for the (220) plane of a simple cubic crystal with a lattice parameter of 3.64 Å. (CO4, K3) | 6 |
| 3.d.(ii) | Copper has a density of 8.96 gm/cm$^3$ and an atomic weight of 63.5. Calculate the distance between the two nearest copper atoms in the FCC structure. The Avogadro number is 6.02x10$^{23}$ per kg mole. (CO4, K3) | 6 |
| 3.e. Answer any one of the following:- | | |
| 3.e.(i) | Calculate the equilibrium potential for sodium ions ($Na^+$) in a neuron at 310 K, if the outside and inside concentrations of sodium ions ($Na^+$) are 145 mM and 15 mM, respectively. (CO5, K3) | 6 |
| 3.e.(ii) | Discuss the concept of molecular machines and motors. (CO5, K2) | 6 |
| **SECTION-C** | | 50 |
| 4. Answer any one of the following:- | | |
| 4-a. | What are systematic errors? Explain different sources of systematic errors and methods to reduce them. (CO1, K2) | 10 |
| 4-b. | Explain the role of measuring instruments in engineering and technology. Discuss examples of any three instruments used. (CO1, K2) | 10 |
| 5. Answer any one of the following:- | | |
| 5-a. | State and prove Work–Energy Theorem. (CO2, K3) | 10 |
| 5-b. | Define impulse and establish its relation with change in momentum. (CO2, K2) | 10 |
| 6. Answer any one of the following:- | | |
| 6-a. | Define entropy and explain its physical significance. What is the expression for change in entropy in a reversible process. (CO3, K2) | 10 |
| 6-b. | Define the thermal efficiency of a heat engine. Can its efficiency be 100%? Justify your answer. (CO3, K2) | 10 |
| 7. Answer any one of the following:- | | |
| 7-a. | Explain the crystal structure of sodium chloride (NaCl). Discuss coordination | 10 |

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number, number of atoms per unit cell, and bonding nature. (CO4, K2)

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|---|---|---|
| 7-b. | Find the atomic radius for simple cubic, body centered cubic and face centered cubic structures. (CO4, K2) | 10 |

8. Answer any one of the following:-

| | | |
|---|---|---|
| 8-a. | Describe the electrical properties of biological cells. How is electrical potential difference developed across the cell membrane? (CO5, K2) | 10 |
| 8-b. | Describe various molecular forces in biological molecules. (CO5, K2) | 10 |