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Printed Page:-4 **Subject Code:- CAS0101A**

Roll. No:

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. For Systematic errors, which one is true? (CO1, K2) 1

(a) Cannot be corrected
(b) Have constant magnitude
(c) Are due to chance
(d) Vary randomly

1-b. A gross error in measurement is caused by: (CO1, K2) 1

(a) Faulty instrument
(b) Wrong observations
(c) Repeated readings
(d) Random fluctuations

1-c. Area under velocity-time graph gives: (CO2, K2) 1

(a) Displacement
(b) Acceleration
(c) Momentum
(d) Mass

1-d. A rocket works on the principle of: (CO2, K2) 1

(a) conservation of energy
(b) Newton's first law
(c) conservation of momentum
(d) conservation of mass

1-e. Internal energy of a thermodynamic system remains constant in (CO3, K2) 1

(a) adiabatic process
(b) isobaric processs
(c) isothermal process
(d) none

1-f. All natural processes are (CO3, K1) 1

(a) Reversible
(b) Cyclic
(c) Irreversible
(d) Isothermal

1-g. Miller indices are useful in crystallography because they (CO4, K2) 1

(a) represent atomic radius
(b) indicate crystal planes
(c) determine crystal mass
(d) give lattice constant directly

1-h. The crystal structure of sodium chloride (NaCl) is (CO4, K1) 1

(a) simple cubic
(b) body-centered cubic
(c) face-centered cubic
(d) hexagonal close packed

1-i. The superconducting state is perfectly _____ in nature (CO5, K1) 1

(a) Paramagnetic
(b) Diamagnetic
(c) Ferromagnetic
(d) All of the above

1-j. The magnetic lines of force cannot penetrate the body of a superconductor, This phenomenon is known as (CO5, K2) 1

(a) Isotopic effect
(b) BCS theory
(c) Meissner effect
(d) London theory

2. Attempt all parts:-

2.a. What is a derived quantity? Give two examples. (CO1, K2) 2

2.b. State Newton's Second Law of Motion. Write the formula. (CO2, K2) 2

2.c. Define entropy. What is the expression for entropy change? (CO3, K2) 2

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

2.e. Explain the Meissner effect in superconductors. (CO5, K2) 2

SECTION-B 30

3. Attempt all parts:-

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

3.a.(i) The mass of an object is measured repeatedly as: 252 g, 248 g, 250 g, 251 g, 249 g, 6

253 g Calculate: Mean mass, Deviation and Standard deviation. (CO1, K3)

3.a.(ii)	In a vernier calliper, there are 10 divisions on the vernier scale and 1 cm on main scale is divided in 10 parts. While measuring a length, the zero of the vernier scale lies between 1.8 cm and 1.9 cm mark on main scale, and 4th division of vernier scale coincides with a main scale division. What is the value of length? (CO1, K3)	6

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

3.b.(i)	A runner covers 100 m in 10 s and next 100 m in 12 s. Find average speed and average velocity (assume path is straight line). (CO2, K3)	6
3.b.(ii)	A wheel of moment of inertia I = 0.8 kg•m² rotates with angular speed 10 rad/s. What is its rotational kinetic energy? (CO2, K3)	6

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

3.c.(i)	A heat engine delivers 400 J of work while absorbing 1600 J of heat. Find its efficiency. (CO3, K3)	6
3.c.(ii)	A system does 450 J of work while rejecting 200 J of heat. Find the change in internal energy. (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)	X-rays of wavelength 1.42 Å are reflected from (110) plane of a rock salt crystal (a=5.64 Å). What is the glancing angle corresponding to second order reflection? (CO4, K3)	6

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

3.e.(i)	Transition temperature for lead is 7.26 K. The maximum critical field for the material is 8×10^5 A/m. Lead has to be used as a superconductor subjected to a magnetic field of $4x10^4$ A/m. Calculate the critical temperature. (CO5, K3)	6
3.e.(ii)	A superconducting material has a critical temperature of 3.7 K in zero magnetic field and a critical field of 0.02 T at 0 K. Find the critical field at 3 K.(CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Discuss the different types of errors in measurement: systematic, random, and gross errors. How to minimize these?(CO1, K2)	10
4-b.	Explain the method of calculating mean value, deviation, and standard deviation in measurement. (CO1, K3)	10

5. Answer any one of the following:-

5-a.	State and prove Work–Energy Theorem. (CO2, K3)	10
5-b.	What is rotational kinetic energy? Compare rotational kinetic energy to linear kinetic energy. (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Describe the construction and working of a heat engine with a neat diagram. Derive an expression for the efficiency of a heat engine and explain why it is always less than unity. (CO3, K2)	10
6-b.	Discuss entropy change in reversible and irreversible processes. Explain why entropy of the universe always increases for irreversible processes. (CO3, K2)	10

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7. Answer any <u>one</u> of the following:-

7-a.	Describe the space lattices of the cubic crystal system. Explain simple cubic, body-centered cubic, and face-centered cubic structures with diagrams and examples. (CO4, K2)	10
7-b.	Explain the crystal structure of sodium chloride (NaCl). Discuss coordination number, number of atoms per unit cell, and bonding nature. (CO4, K3)	10

8. Answer any <u>one</u> of the following:-

8-a.	What are fullerenes? Describe the structure, properties, and applications of fullerene (C_{60}). (CO5, K2)	10
8-b.	Define superconductors? What are type I and type II superconductors? Differentiate between them. (CO5, K2)	10