

B.Sc. Semester - 4 (CBCS) Examination

July-2025 [OLD COURSE]

PHYSICS(CORE)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

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- Que.1(A) Answer the following questions in detail (Any one) (07)**
- (1) Define specific heat of gas and derive Mayer's formula.
 - (2) Write a note on Carnot's ideal engine and Carnot's cycle.
- Que.1(B) Answer the following questions in brief (Any one) (04)**
- (1) Write a note on thermal equilibrium and zeroth law of thermodynamics.
 - (2) Discuss porous-plug experiment.
- Que.1(C) Answer the following questions in short (Any three) (03)**
- (1) The first law of thermodynamics is the law of conservation of energy. [True / False]
 - (2) The unit of specific heat in CGS system is
 - (3) $C_p - C_v = R$ is known as Newton's formula. [True / False]
 - (4) What is isobaric process?
 - (5) Thermos flask is an example of isolated system in the thermodynamics. [True / False]
- Que.2(A) Answer the following questions in detail (Any one) (07)**
- (1) Explain change in entropy in adiabatic, reversible and irreversible process.
 - (2) Discuss distribution of energy in black body spectrum and discuss its results.
- Que.2(B) Answer the following questions in brief (Any one) (04)**
- (1) State and explain Rayleigh-Jeans law.
 - (2) Write a note on unattainability of absolute zero.
- Que.2(C) Answer the following questions in short (Any three) (03)**
- (1) During an adiabatic process, the change of entropy is
 - (2) In a cycle of reversible process, the total change in entropy is always non zero. [True / False]
 - (3) The entropy of the universe always decreases. [True / False]
 - (4) Stefan's law state the $E = \sigma T^4$ [True / False].
 - (5) Rayleigh-Jeans law holds good for wavelengths.
- Que.3(A) Answer the following questions in detail (Any one) (07)**
- (1) Derive general expression of Maxwell's thermodynamic relation and derive four fundamental thermodynamic relations from it.
 - (2) Define thermodynamic potentials. Discuss Helmholtz and internal energy function.
- Que.3(B) Answer the following questions in brief (Any one) (04)**
- (1) Derive Clausius - Clapeyron's latent heat equation.
 - (2) Explain Enthalpy and Gibbs energy.
- Que.3(C) Answer the following questions in short (Any three) (03)**
- (1) Enthalpy $H = U + PV + R$? [True / False]
 - (2) Helmholtz free energy $F = \dots\dots\dots$
 - (3) First law of thermodynamics is $dQ = dU - PdV$ [True / False]
 - (4) Internal energy of the system remains constant in an isochoric adiabatic process. [True / False]
 - (5) Enthalpy does not remain constant in reversible isobaric adiabatic process. [True / False]

- Que.4(A) Answer the following questions in detail (Any one) (07)**
(1) What do you mean by logic gate? Explain Basic three logic gates.
(2) Discuss construction and working of JFET.
- Que.4(B) Answer the following questions in brief (Any one) (04)**
(1) Write a note on Thermistor.
(2) Explain NOR gate as a universal gate.
- Que.4(C) Answer the following questions in short (Any three) (03)**
(1) Write the full form of UJT?
(2) The binary system has a base of eight. [True / False]
(3) UJT is a bipolar device. [True / False]
(4) NOT gate has only one input and one output and it is known as inverter.
[True / False]
(5) What is the form of LED?
- Que.5(A) Answer the following questions in detail (Any one) (07)**
(1) Explain in detail: De Sauty's bridge.
(2) Write a note on L-C-R series ac circuit.
- Que.5(B) Answer the following questions in brief (Any one) (04)**
(1) Explain the Barkhausen Criterion.
(2) Derive ac bridge balance condition.
- Que.5(C) Answer the following questions in short (Any three) (03)**
(1) Write unit of Inductor.
(2) The condition $X_L = X_C$ is known as
(3) The value of unknown inductance can be measured using Maxwell's Bridge.
[True / False]
(4) Owen's bridge is used to determine the unknown inductance in terms of resistance and capacitance. [True / False]
(5) What is the unit of Capacitor?
