

Time: 2:30 Hours**Marks: 70****Instructions:**

1. All questions are compulsory.
 2. Figures to the right indicate marks.
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Q.1 (A) Answer any one question.**[7]**

- (1) Defining specific heats of gas, derive Mayer's formula.
- (2) Explaining heat engine, derive formula for efficiency of heat engine. Explain Carnot's ideal heat engine.

Q.1 (B) Answer any one question.**[4]**

- (1) Derive the formula of work done during an adiabatic process.
- (2) Explain Porous plug experiment with experimental setup and working.

Q.1 (C) Answer any three questions.**[3]**

- (1) The value of Joule's mechanical equivalent of heat is $J = \text{_____}$ Joule/cal.
- (2) What is isobaric process?
- (3) In an adiabatic process, pressure (P) and volume (V) are related by _____.
- (4) At sufficient low temperatures, all gases show a _____ effect.
- (5) The efficiency of a Carnot's engine working between 77°C and 427°C is _____.

Q.2 (A) Answer any one question.**[7]**

- (1) Explaining entropy of a perfect gas, obtain change in entropy in terms of
(i) T and V (ii) T and P (iii) P and V.
- (2) Explain distribution of energy in black body spectrum and discuss its results.

Q.2 (B) Answer any one question.**[4]**

- (1) Explain change in entropy in reversible process.
- (2) Define Stefan – Boltzmann law.

Q.2 (C) Answer any three questions.**[3]**

- (1) The entropy of the universe _____.
- (2) The efficiency of heat engine is less than one. Agreed?
- (3) In Wien's law of energy distribution, E_m is proportional to _____.
- (4) Rayleigh – Jeans law holds good for _____ wavelengths.
- (5) On the basis of quantum theory, _____ derive the formula of distribution of energy with wavelength.

Q.3 (A) Answer any one question.**[7]**

- (1) Explain following thermodynamic potentials and define their relations with thermodynamic variables: (i) Enthalpy H and (ii) Gibbs function G.
- (2) Discuss following applications of Maxwell's thermodynamic relations:
(i) Clausius – Clapeyron's latent heat equation.
(ii) Specific heat equation ($C_p - C_v = R$).

Q.3 (B) Answer any one question.**[4]**

- (1) Explain internal energy of the system in terms of thermodynamic variables.
- (2) Write a note on Helmholtz free energy (F).

- Q.3 (C) Answer any three questions.** [3]
- (1) Enthalpy is the total heat of the system. Agreed?
 - (2) In an isothermal isobaric process, Gibbs free energy (G) _____.
 - (3) _____ is called first thermodynamic potential.
 - (4) For an adiabatic process, $dQ =$ _____.
 - (5) In an isochoric adiabatic process, change in internal energy of the system is _____.
- Q.4 (A) Answer any one question.** [7]
- (1) Drawing equivalent circuit of UJT, discuss its working.
 - (2) Write a note on basic logic gates.
- Q.4 (B) Answer any one question.** [4]
- (1) Write a note on Multicolor LED.
 - (2) Write a note on UJT relaxation oscillator.
- Q.4 (C) Answer any three questions.** [3]
- (1) The power rating of LED is of order of _____.
 - (2) A Photo diode is always connected in _____ biased.
 - (3) The FET is a _____ controlled device.
 - (4) _____ is also called double based diode.
 - (5) A signal which is continuously varying with respect to time is called _____ signal.
- Q.5 (A) Answer any one question.** [7]
- (1) Deriving an expression of current for L-C-R series a.c. circuit, explain series resonance and Q- factor.
 - (2) Explaining principle and action of Phase shift oscillator, write its advantages and disadvantages.
- Q.5 (B) Answer any one question.** [4]
- (1) Explain De Sauty bridge. Write its advantages and disadvantages.
 - (2) Explain action of Colpitt oscillator.
- Q.5 (C) Answer any three questions.** [3]
- (1) For inductive circuit, the value of Q – factor is about _____.
 - (2) Resonant frequency does not depend upon the value of _____.
 - (3) Owen's bridge is used to determine the value of an unknown _____.
 - (4) _____ bridge is used to determine specific conductivity of an electrolyte.
 - (5) Sinusoidal oscillator converts _____ energy into _____ energy.
