



Shree H.N.Shukla group of colleges

PHYSICS

S.Y.B.Sc. (Sem. IV) (CBCS)

Preliminary Examination

PAPER- 401

THERMODYNAMIC & ELECTRONICS

[Time : 2 : 30Hours]

[Total Marks : 70]

- Instructions :**
- (1) All questions are compulsory.
 - (2) Symbols have their usual meaning.
 - (3) Right side indicates marks.

- 1 (a) Give the correct answers of following questions . 4
- (1) Write the formula for efficiency of heat engine.
 - (2) What is the value of "I" ?
 - (3) In adiabatic process, the heat energy of system remains constant. True/False
 - (4) Write the relation between β and C_V .
- (b) Answer the following : (answer any one) 2
- (1) Find the efficiency of the Carnot's engine working between temperature 100°C and 0°C .
 - (2) Find the temperature of sink, when Carnot's engine absorbs 100 cal. heat from source at temperature 300K and reject 50 cal. of heat to sink.
- (c) Answer in detail : (answer any one) 3
- (1) Write the first law of thermodynamics and explain it.
 - (2) Write note on specific heat of the gas.

- (d) Write a answer on (answer any one) 5
1. Give the statement of Carnot's theorem and its proof.
 2. Explain : The Joule-Thomson expansion and porous plug experiment.
- 2 (a) Give the correct answers of following questions 4
- (1) In isothermal process, the entropy of system remains constant. True/False
 - (2) Write the unit of entropy.
 - (3) What is the velocity of thermal radiation ?
 - (4) Write the formula for the Stefan's law.
- (b) Answer the following : (answer any one) 2
- (1) To calculate the change in entropy, when 50gm water at 100°C converted into steam at same temperature.
 - (2) Find the increase entropy when 28 gm ice at 0°C converted into water at same temperature.
- (c) Answer in detail : (answer any one) 3
- (1) Explain the change in entropy in reversible process.
 - (2) Describe the Wien's displacement law.
- (d) Write a note on : (answer any one) 5
- (1) Explain the temperature-entropy diagram (T-S diagram) in detail.
 - (2) Describe the Plank's law and prove that Wien's and Rayleigh-Jean's law in relation to Plank's law.
- 3 (a) Give the correct answers of following questions 4
- (1) Write the names of thermodynamical potentials.
 - (2) Write Maxwell's second thermodynamical relation.
 - (3) Write the first latent heat equation.
 - (4) Give the formula for Joule-Thomson coefficient.

- (b) Answer the following : (answer any one) 2
- (1) Find the pressure on water when water boil at 150°C if the change in specific volume when 1 gm of water is converted into steam is 1676 cc.
 - (2) Find the value of change in the boiling point of water when pressure increased from 1.0 to 1.2 atmosphere.
[Steam : $L = 540 \text{ cal}$, 1 atm. pressure = 10^6 dynes/cm^2 , $dV = 1676 \text{ cc}$]
- (c) Answer in detail : (answer any one) 3
- (1) Derive the Clausius-Clapeyron's first latent heat equation.
 - (2) Derive the first and second TdS equation.
- (d) Write a answer on : (answer any one) 5
- (1) What is Joule-Thomson effect ? Derive an equation of Joule-Thomson coefficient.
 - (2) Derive the Maxwell's first and second thermodynamical relations.
- 4 (a) Give the correct answers of following questions 4
- (1) To convert $(13)_{10}$ into binary number.
 - (2) Write the full form of UJT.
 - (3) Give the name of digital signal.
 - (4) Which electronics component is used to construct NOT gate ?
- (b) Answer the following : (answer any one) 2
- (1) Find the value of R_{B1} and R_{B2} for given the UJT parameter are $R_{BB} = 20 \text{ k}\Omega$ and $\alpha = 0.8$.
 - (2) Find the intrinsic stand-off ratio (ρ) of UJT for $R_{B1} = 20 \text{ k}\Omega$ and $R_{B2} = 10 \text{ k}\Omega$.
- (c) Answer in detail : (answer any one) 3
- (1) Discuss the OR gate in detail.
 - (2) Explain the characteristic of UJT.

- (d) Write a answer on : (answer any one) s
- (1) Explain the construction, working and characteristic of solar cell.
 - (2) Discuss in detail NAND and NOR gate as universal gate.

- 5 (a) Give the correct answers of following questions 4
- (1) Write an expression of resonance frequency for L-C-R series circuit.
 - (2) What is an expression of Q-factor for L-C-R series circuit ?
 - (3) How many phase shift is produced by single RC section in phase shift oscillator ?
 - (4) An oscillator converts d.c. power into _____

- (b) Answer the following : (answer any one) 2
- (1) A series R-C circuit contains a resistor of $6 \text{ } \Omega$ and capacitor of reactance $8 \text{ } \Omega$ with an ac source of $20\text{V}-50\text{Hz}$. Find the impedance and current flowing in the circuit.
 - (2) A series L-R circuit with resistance $4 \text{ } \Omega$ and inductance of $0.03/\omega$ are connected to an ac source of $20\text{V}-50\text{Hz}$. Find the circuit impedance and current.

- (c) Answer in detail : (answer any one) 3
- (1) Derive the condition of Maxwell's L/C bridge balance.
 - (2) Derive the condition for Owen's bridge balance.

- (d) Write a answer on : (answer any one) s
- (1) Derive expressions for the impedance and ac current of L-C-R circuit connected in series with ac source.
 - (2) Explain the Phase shift oscillator with neat diagram.

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