



**DY-003-2014002**

Seat No. \_\_\_\_\_

**Second Year B. Sc. (Sem. IV) (CBCS) (W.E.F. 2019)**

**Examination**

**April - 2022**

**Physics - 401**

*(Thermodynamics & Electronics)*

**Faculty Code : 003**

**Subject Code : 2014002**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

**Instruction :** Answer any five questions.

- 1 (a) Write the answer of the following questions : 4  
(1) Define Zeroth law of thermodynamics.  
(2) What is the value of J ? (in thermodynamics)  
(3) If the work is done by the system then  $\Delta W$  is \_\_\_\_\_ . (Positive / Negative)  
(4) What is called open system ?
- (b) Solve the following : 2  
(1) Find the efficiency of a Carnot's engine working between  $627^{\circ}\text{C}$  and  $27^{\circ}\text{C}$ .
- (c) Answer the following : 3  
(1) What is reversible process ?
- (d) Answer the following in detail : 5  
(1) Explain porous plug experiment.
- 2 (a) Write the answer of the following questions : 4  
(1) Define First law of thermodynamics.  
(2) What is the unit of Specific heat in C.G.S.  
(3) If the heat is taken by the system then  $\Delta Q$  is \_\_\_\_\_ . (Positive / Negative)  
(4) Define: isolated system.
- (b) Solve the following : 2  
(1) Find the efficiency of the Carnot's engine working between the steam point  $100^{\circ}\text{c}$  and the ice point  $0^{\circ}\text{c}$ .
- (c) Answer the following : 3  
(1) What is irreversible process ?
- (d) Answer the following in detail : 5  
(1) Explain heat engine.

- 3 (a) Write the answer of the following questions : 4
- (1) Define entropy.
  - (2) Define change of entropy in equation form  $ds =$  \_\_\_\_\_.
  - (3) The entropy remains \_\_\_\_\_ in reversible process. (Constant, Increase, Decreases)
  - (4) Which physical state has maximum entropy \_\_\_\_\_ . (Gas Liquid, Solid)
- (b) Solve the following : 2
- (1) Compute the change in entropy when 10 gm of ice at 0°C is converted into water at the same temperature, given that the latent heat of fusion of 80 cal per. gm.
- (c) Answer the following : 3
- (1) Explain : entropy and disorder.
- (d) Answer the following in detail : 5
- (1) Write notes on : T-S diagram.
- 4 (a) Write the answer of the following questions : 4
- (1) Define Wiens law.
  - (2) Value of Stefan's constant is  $5.67 \times 10^{-8} \text{ W/M}^2.\text{k}^4$  in M.K.S. unit. (True / False)
  - (3) Equation  $E_\lambda = \frac{e\lambda}{a\lambda}$  is known as \_\_\_\_\_ law.
  - (4) Unit of the plank's constant (h) is \_\_\_\_\_.
- (b) Solve the following : 2
- (1) Calculate the radiant emittance of a black body at a temperature :
    - (1) 400K
    - (2) 4000K $(\sigma = 5.672 \times 10^{-8} \text{ W/m}^2.\text{K}^4)$
- (c) Answer the following : 3
- (1) What is a Black Body ? Explain Fery's Black Body.
- (d) Answer the following in detail : 5
- (1) Write a short note on Stefan's law.
- 5 (a) Write the answer of the following questions : 4
- (1) What is enthalpy ?
  - (2) What are the thermodynamic variables ?
  - (3) What is the equation of enthalpy H ?
  - (4) What is Maxwell forth relation  $\left(\frac{\partial V}{\partial T}\right)_P =$  \_\_\_\_\_.
- (b) Solve the following : 2
- (1) At 373k 1 gm. of water occupies 1601 cm<sup>3</sup> on evaporation, calculate latent heat of steam if  $\frac{\partial P}{\partial T} = 35985 \text{ dyne/cm}^2.\text{k}.$

- (c) Answer the following : 3  
 (1) Derive Maxwell third relation.
- (d) Answer the following in detail : 5  
 (1) Write a short note on Joule-Thomson effect.
- 6 (a) Write the answer of the following questions : 4  
 (1) What is Gibbs free energy ?  
 (2) What is latent heat ?  
 (3) What is Maxwell first relation ?  
 (4) What is thermodynamical potential ?
- (b) Solve the following : 2  
 (1) Find the increase in the boiling point of water at 100°C when the pressure is increased by one atmosphere. Latent heat of vaporization of steam is 540 cal/gm and 1 gm of steam occupies a volume of 1677 cm.  
 (1 atmosphere =  $76 \times 13.6 \times 980$  Dyne/cm<sup>2</sup>)
- (c) Answer the following : 3  
 (1) Derive Maxwell second relation.
- (d) Answer the following in detail : 5  
 (1) Write a short note on Specific heat equation.
- 7 (a) Write the answer of the following questions : 4  
 (1) What is the full form of JFET ?  
 (2) Give any two uses of solar cell.  
 (3) What is pinch off voltage ( $V_p$ ) ?  
 (4) Give any two disadvantages of BJT.
- (b) Solve the following : 2  
 (1) The transfer characteristic of a JFET reveals that when  $V_{GS} = -10$  V,  $I_D = 7.3$  mA determine the value of  $R_S$ .
- (c) Answer the following : 3  
 (1) What are the differences between BJT and FET.
- (d) Answer the following in detail : 5  
 (1) Explain the construction and working of UJT.
- 8 (a) Write the answer of the following questions : 4  
 (1) What is digital signal ?  
 (2) NAND gate is a combinations of \_\_\_\_\_ gate and gate.  
 (3)  $A + 0 =$  \_\_\_\_\_.  
 (4) Draw the Symbol of NOT gate.
- (b) Solve the following : 2  
 (1) Convert binary number in to decimal number :  
 (any two)  
 $(110110)_2$ ,  $(110011)_2$ ,  $(110001)_2$

- (c) Answer the following : 3  
 (1) Discuss binary number and decimal number system ?
- (d) Answer the following in detail : 5  
 (1) Discuss Universal logic gate with appropriate diagram.
- 9** (a) Write the answer of the following questions : 4  
 (1) What is bridge circuit ?  
 (2) What is Schering bridge ?  
 (3) What is the use of Owen's bridge ?  
 (4) The perfect balance can be obtained only in the case of air capacitor for De sauty's bridge. (True/False)
- (b) Solve the following : 2  
 (1) A Maxwell bridge is used to measure an inductance of a coil. The balance is obtained when  $C_1 = 0.01 \mu\text{F}$ ,  $R_1 = 470 \text{ K}\Omega$ ,  $R_2 = 2.7 \text{ K}\Omega$  and  $R_3 = 100 \text{ K}\Omega$ . Find series internal resistance  $R_X$  and unknown inductance  $L_X$ .
- (c) Answer the following : 3  
 (1) Explain Maxwell's impedance bridge.
- (d) Answer the following in detail : 5  
 (1) Explain Owen's bridge.
- 10** (a) Write the answer of the following questions : 4  
 (1) In colpitt's oscillator the operative frequency depends on \_\_\_\_\_. (L, C, L and C)  
 (2) The Hartley Oscillator, the equation of feedback fraction is  $m_v = \frac{L_2}{L_1} \cdot \left( \frac{L_1}{L_2}, \frac{C_1}{C_2} \right)$   
 (3) What is an Oscillator ?  
 (4) \_\_\_\_\_ is tapped in Colpitt's Oscillator. (Capacitor, Inductor)
- (b) Solve the following : 2  
 (1) In a Hartley Oscillator,  $L_1 = 1000 \mu\text{H}$  and  $L_2 = 100 \mu\text{H}$ . Calculate, the feedback fraction.
- (c) Answer the following : 3  
 (1) Discuss Barkhausen Criteria.
- (d) Answer the following in detail : 5  
 (1) Explain Colpitt's Oscillators with neat diagram.