

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of remaining six questions.
 (3) Figures to the right indicate full marks.

1. (a) Explain voltage clamp mechanism in detail. 5
 (b) Define a model. Mention the steps for modeling. 5
 (c) Write expression for Goldman's equation and explain its significance. 5
 (d) Explain insulin glucose feedback system in short. 5

2. For thermoregulatory system explain following :-
 (a) Draw and explain working of thermo-regulatory plant model. 10
 (b) Draw block diagram of thermoregulatory controller model and explain it in short. 5
 (c) Mention any two industrial application of thermo regulatory system and explain any one in detail. 5

3. A squid Giant Axon has following ratio of permeabilities and concentration :-

Ion	Cytoplasm mM	Extracellular fluid mM	Ratio of permeabilities
Na ⁺	50	440	0.04
K ⁺	400	20	1
Cl ⁻	52	560	0.45

Considering $\frac{kT}{q} = 25.3 \text{ mV}$. Calculate following :-

- (a) Nernst potential for Na⁺ ion. 5
 (b) Nernst potential for K⁺ ion. 5
 (c) Membrane potential V_m for squid giant axom. 10

4. (a) Draw and explain electrical equivalent model of biological mebrane in short. 5
 (b) Explain active transport mechanism with neat diagram. 5
 (c) Explain biophysic tools with related laws and expressions. 5
 (d) Derive Nernst equation and give its significance. 5

5. (a) Explain model of cardiovascular system with proper diagram. 5
 (b) Explain validity criteria for eye movement model. 5
 (c) Draw and explain reciprocal innervation model of eye movement in short. 5
 (d) Explain four types of eye movement and mention the name of eye muscles responsible for eye movement. 5

6. (a) Write mathematical expression of cable equation and mention its significance. 5
 (b) Explain the role of spindle receptor and golgi tendon organ in modeling of neuromuscular system. 5
 (c) Draw and explain model of drug delivery system. 5
 (d) Differentiate between one control and two control mechanism for neuromuscular system. 5

7. Write short note on (any four) :- 20