

66534

BMS (Elective) –Solution		
1	(a)	Describe steps of modelling. 05
		Steps of modelling with description
	(b)	Explain different biophysics tools. 05
		Four tools with necessary equations and definitions
	(c)	Differentiate between Golgi tendon organ and Spindle receptor 05
		Location, significance, diagram
	(d)	Explain stretch reflex and reflex arc. 05
		Definition, all the physiological components of stretch reflex, diagram
2	(a)	Differentiate with suitable example, 10
		(i) Compartmental modelling and non-compartmental modelling
		(ii) Lumped parameter and distributed parameter models.
		(i) Compartmental and Non-compartmental modelling 05
		Definition, description, example diagram
		(ii) Lumped parameter and distributed parameter model 05
		Definition, description, example diagram
	(b)	Explain with necessary equation linearized model of immune system. 10
		Definition of all the parameters 3
		Equations of all the parameters 3
		Bock diagram 3
		Graph 1
3	(a)	With reference to the Westheimer's eye movement model, 10
		i) find the expression for displacement
		ii) find the time to peak and maximum displacement
		i) Derivation to find displacement 5
		transfer function of second order system
		step response of second order system
		ii) Derivation to find t_p 5
		value of t_p using ϵ and ω_n
		Maximum displacement using value of t_p
	(b)	Draw and explain the plant model of human thermoregulatory system. 10
		Block diagram 04
		Explanation 06

4	(a)	What are the assumptions of voltage clamp experiment? Draw and explain the experimental setup of voltage clamp experiment. Discuss the results of the experiment.	Assumption Diagram of experimental setup Explanation Output graphs Explanation	02 03 04 03
	(b)	Extracellular and Intracellular concentrations of Na ⁺ , K ⁺ and Cl ⁻ are as given T=20°C. ECF ICF Na ⁺ 230 mM K ⁺ 30 mM Cl ⁻ 1090 mM Determine the equilibrium potentials for Na ⁺ , K ⁺ and Cl ⁻ . Na ⁺ 25 mM K ⁺ 800 mM Cl ⁻ 72 mM E _{Na} = 55 mV, E _K = -82 mV, E _{Cl} = -67.9 mV	05	
5	(a)	With reference to the reciprocal innervation model of eye movement describe the procedure and discuss the results of, i) isometric experiment ii) isotonic experiment	Experimental setup for plating length – tension diagram Diagram and explanation ii) isotonic experiment Experimental setup for plating force-velocity relationship Diagram and explanation	02 03 02 03
	(b)	Explain with neat diagrams sliding filament theory.	All the steps of muscle contraction with description Diagrams of all the steps	10 06 04
6	(a)	Derive the expression for voltage across a membrane with non-zero permeability for all ions. Assume the membrane is permeable to Cl ⁻ and K ⁺ and $\mu_{Cl} > \mu_{K}$	Derivation using Ohm's law and Fick's law $V_m = \frac{RT \ln \left[\frac{[K]_{in} [Cl]_{out}}{[K]_{out} [Cl]_{in}} \right] \cdot \frac{\mu_{Cl} - \mu_{K}}{\mu_{Cl} + \mu_{K}}}{2}$	10
	(b)	Explain with necessary diagram validation of neuromuscular system	Diagram Explanation of validation of open loop and close loop neuromuscular system	10 03 07