

GANPAT UNIVERSITY
B. TECH SEM- VI (BM & I) REGULAR EXAMINATION- APRIL-JUNE 2017
2BM602: Biopotential & Recorders

TOTAL MARKS: 60

TIME: 3 HRS

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.

SECTION: I

- Q.1** (10)
 (a) Give the basic difference between Nernst equation & GHK equation. Explain briefly the role of permeability on (i) Resting membrane voltage (ii) Generation of action potential. 6
 (b) Define active and passive diffusion. Explain briefly the following: 4
 (i) Ohm's law of Diffusion
 (ii) Fick's law of Diffusion

OR

- Q.1** (10)
 (a) Draw the 3-ion channel for H^+ , Cl^- & SO_4^{2-} and also explain why considering the polarity of battery in 3-ion channel model is very important? 6
 (b) What is difference between Action potential and End-plate potential? Explain it briefly. 4
Q.2 (10)
 (a) Describe in detail the setup to measure action potential with necessary diagram. 4
 (b) The cellular concentration of H^+ , Na^+ , Cl^- & Leakage ions is as follows: 6

	Intracellular Concentration	Extracellular Concentration
Na^+	14	150
Cl^-	142	12
H^+	0.001	0.0001
Leakage ions	0.2	2

The permeability during resting state is in the ratio of 1:0.5:10:2 & during excited state it is 10:15:2:5.

Calculate RMC & action potential under above mentioned condition.

OR

- Q.2** (10)
 (a) Assume three ion H^+ , Na^+ & HCO_3^- the inside concentration for H^+ , Na^+ & HCO_3^- are 305, 65, 85 respectively and outside concentration for the same is 30, 600, 340. 6
 The membrane permeability is as under:
 At resting state $\rightarrow P_{H^+}:P_{Na^+}:P_{HCO_3^-} = 1.5:0.2:1.1$
 Calculate the RMP using Goldman's equation. What change in RMP will happen if permeability of Na^+ ion channel is halved? 4
 (b) Write short note on Donnan's Equilibrium. 4
Q.3 (10)
 (a) Derive the Hodgkin - Huxley model equation for major three ions of human body. 6
 (b) Describe physiology of muscles contraction using "walk alone" theory. 4

SECTION: II

- Q.4 (10)
- (a) Define Biomedical Recorder. Explain different types of recorder and their biomedical applications for diagnosis. 4
- (b) What are the different types of muscles? Diagrammatically show the difference between the types of muscle fibers. 4
- (c) What is Isolation amplifier? Enlist the application of isolation amplifier in biomedical data acquisition. 2

OR

- Q.4 (10)
- (a) Explain in detail the block diagram of ECG & EEG acquisition system. 5
- (b) What is artifact? How many types of artifact interfere during the measurement of ECG? Explain in brief. 5

- Q.5 (10)
- (a) Which signals is required for analysis of eye movements? Describe the signal characteristics and electrode placement system. 3
- (b) Enlist various muscular disorders. What significant changes are observed in EMG signals during diseased state? 4
- (c) Explain the conductive system of nervous system and explain nerve conduction velocity briefly. 3

OR

- Q.5 (10)
- (a) Enlist at least four biological signals with its frequency range, amplitude and explain with its necessary waveform pattern. 6
- (b) Describe briefly Neuromuscular Junction and enlist the primary function on acetylcholine. 4

- Q.6 (10)
- (a) Design the 2nd order filter for ECG signal acquisition. Also compare the response of 1st order v/s 2nd order filter with necessary calculation and circuit diagram.
- (b) Design the instrumentation amplifier with gain of 100 with necessary calculation & circuit diagram.

-----END OF PAPER-----