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B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Fifth Semester

18BME371T - NEUROENGINEERING

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks) — Answer **all** Questions

		Marks	BL	CO
1.	Identify which is not a function of neuroglia. (A) Non-conduction (B) Support system (C) Connectivity (D) Transmitting impulse	1	1	1
2.	Renshaw cell inhibition is a type of synaptic inhibition. Identify its alternative name. (A) Postsynaptic (B) Presynaptic (C) Feedback (D) feed forward	1	1	1
3.	Indentations or grooves in the brain can also be known as: (A) Sulcus (B) Gyrus (C) Gray matter (D) White matter	1	1	1
4.	Select the part of hind brain among the given choices. (A) Cerebellum (B) Cerebrum (C) Thalamus (D) Hypothalamus	1	1	1
5.	Sympathetic nervous system falls under the _____ nervous system. (A) Central (B) Afferent Autonomic (C) Efferent autonomic (D) Somatic nervous	1	1	2
6.	Tough white fibrous connective tissues form which part of the brain? (A) Dura matter (B) Arachnoid (C) Subarachnoid (D) Pia matter	1	1	2
7.	Thoracic spine contain _____ number of vertebrae. (A) 12 (B) 8 (C) 5 (D) 1	1	1	2
8.	The gap between transmit and receiving section of synapse is known as: (A) Synaptic cleft (B) Synaptic vesicle (C) Mitochondrion (D) Synaptic knob	1	1	2
9.	Find out the resting membrane potential of humans from the following (A) -70mv (B) 70mv (C) -59mv (D) 40mv	1	1	3
10.	Select the neurotransmitter that is both inhibitory and excitatory. (A) GABA (B) Glutamate (C) Histamine (D) Dopamine	1	1	3
11.	Identify the BCI signal that shows medium level of consciousness. (A) Alpha (B) Delta (C) Theta (D) Beta	1	2	3

12.	In fMRI, BOLD is an acronym where BO represents: (A) Blood Oxygenation (B) Brain Organisation (C) Brain Origin (D) Blood Origin	1	1	3
13.	In BCI , identify the part that activates receptors of the substituting modality. (A) Actuator (B) Coupling system (C) Sensors (D) Environment	1	1	4
14.	Definition - Ability of the brain to modify its connections or re-wire itself, is for the following term. (A) Neuroplasticity (B) Neuroelasticity (C) Neural network (D) Neural feedback	1	1	4
15.	Among the following, identify the tactile receptor in skin responsible for sensing pressure. (A) Merkel discs (B) Free nerve endings (C) Pacinian corpuscles (D) Ruffini endings	1	1	4
16.	To avoid thermal damage of skin, what should be the maximum temperature of thermal stimulation? (A) 44 degree Celsius (B) 34 degree Celsius (C) 54 degree Celsius (D) 64 degree Celsius	1	1	4
17.	Commercial deep brain stimulation electrodes diameter is in the following range. (A) 1.27-1.4mm (B) 11-20 mm (C) 20-25mm (D) 0.5-0.7mm	1	1	5
18.	Deep brain stimulation of Lateral Hypothalamus can cure which disease? (A) Obesity (B) Depression (C) Addiction (D) Alzheimer	1	2	5
19.	Another name for non-invasive cortical stimulation is: (A) Transcranial (B) Epidural (C) Theta burst (D) Paired Associative	1	1	5
20.	Identify the brain lobe responsible for visual processing. (A) Occipital Lobe (B) Frontal Lobe (C) Parietal Lobe (D) Temporal Lobe	1	1	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	Illustrate and label the structure of neuron.	4	2	1
22.	Mention the salient features of the slow neurotransmission.	4	2	2
23.	Distinguish between the Chemical and Electrical synapses.	4	3	2
24.	What is the best feature extraction techniques used in brain signal extraction?	4	3	3
25.	Explain about non-invasive techniques using from Brain computer interfacing.	4	2	3
26.	Explain about Bladder control implant.	4	2	4
27.	State the advantages of Fitzhugh Nagumo models	4	3	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) Draw and label the anatomical structure of brain and explain the main parts.	12	2	1
	(OR)			
	(b) Explain all the Properties of nerve fibers.			

29.	(a) Explain the stages in neurotransmission with the neat diagram.	12	1	2
	(OR)			
	(b) Classify and explain about the neurotransmitters.			
30.	(a) i) Explain the working of EEG with the neat diagram. (8 Marks) ii) Mention the different brain signals acquired using EEG. (4 Marks)	12	3	3
	(OR)			
	(b) Explain the working of fMRI and give its advantages over the other BCI techniques.			
31.	(a) Explain about the bionic eye and how the various visual prosthetics can be used.	12	3	4
	(OR)			
	(b) Draw the structure of human ear and explain about the Cochlear implant.			
32.	(a) How can Spinal cord stimulation be done? Explain the process and how it is significant over Transcranial direct current stimulation.	12	2	5
	(OR)			
	(b) Explain the mathematical model of Hodgkin Huxley neuron model.			

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