Question Paper Code : 50369

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth/Sixth Semester

Biomedical Engineering

CBM 342 — BRAIN COMPUTER INTERFACE AND APPLICATIONS

(Common to Computer Science and Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Instrumentation and Control Engineering/ Medical Electronics)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the four major components of BCI?

2. How do we measure the brain activity without surgery?

3. Mention the metal evaporation process flow.

4. Present the significance of rhythm in EEG.

5. Specify the best feature extraction method.

6. Recall the specific uses of wavelets.

7. What is feature extraction technique used in BCI?

8. Specify the techniques applied in SVM.

9. Define fMRI in BCI.

10. Is visual feedback is an invasive or noninvasive method? Justify it.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the schematic illustration of a brain computer interface using five stages including signal acquisition, signal processing, feature extraction, data classification and the control interface.

Or

(b) What are the different classification Algorithms for BCI systems? Explain.

12. (a) With a suitable diagram, explain slow cortical potential shifts modulate P300 amplitude and topography in humans.

Or

(b) Elucidate the different stages of an action potential and its propagation with neat sketches.

13. (a) Compare and contrast on AR, MA, ARMA models in BCI.

Or

(b) Analyze the effect of PCA for feature reduction in non-stationary EEG based motor imagery of BCI system.

14. (a) What are hidden Markov models? Explain and demonstrate with example.

Or

(b) Describe Prediction Model for a Noninvasive Brain-Computer Interface Platform using regression.

15. (a) Illustrate the application of BCI Multi-functional Neuroprosthetic System for Restoration of Motor Function in brain.

Or

(b) Discuss the working of functional electrical stimulation therapy controlled by a P300-based brain computer interface.

PART C — (1 × 15 = 15 marks)

16. (a) With suitable diagram, assess the working of Gaussian Mixture Model Based on Genetic Algorithm for Brain- computer Interface.

Or

(b) Draw the Schematic of a brain-computer interface system of a Noninvasive brain-actuated control of a mobile robot navigation.

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