Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50397

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

Fifth/Sixth Semester

Biomedical Engineering

CBM 370 – WEARABLE DEVICES

(Common to Electronics and Communication Engineering/
Electronics and Telecommunication Engineering and Medical Electronics
Also common to Minor Degree)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the drawbacks of conventional systems for wearable monitoring.

2. What are the key components of wearable systems?

3. How does the physical shape and placement of sensors impact wearability issues in wearable technology?

4. Outline the technical challenges associated with sensor design for reducing energy consumption in wearable devices.

5. Outline the primary need for wireless monitoring in healthcare settings.

6. Define Body Area Network (BAN) and outline its role in healthcare.

7. Compare and contrast passive smart textiles with active smart textiles.

8. How does conductive fibers and conductive fabrics used in the fabrication of smart textiles?

9. What are the key benefits of neural recording in medical diagnostics?

10. Outline the role of gait analysis in the field of sport medicine.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the significances of wearable systems in healthcare and fitness monitoring, highlighting how it addresses the limitations of conventional monitoring systems.

Or

(b) Discuss the different types of sensors used in wearable systems for monitoring human movement and physiological parameters, focusing on their advantages, limitations, and applications in real-world scenarios.

12. (a) (i) How do wearable technology designers address wearability issues related to the physical shape and placement of sensors? (9)

(ii) How does the impact of using wearables affects comfort and adoption rates? (4)

Or

(b) (i) Discuss in detail the advancements and limitations in power requirements for wearable devices, considering options such as solar cells, vibration-based systems, thermal-based solutions, and hybrid energy harvesters like thermoelectric photovoltaic systems and thermopiles? (8)

(ii) How does the wearable technologies balance power efficiency with practicality in real-world applications? (5)

13. (a) (i) Discuss the technical challenges related to system security and reliability in the context of Body Area Networks (BANs) used for healthcare applications. (9)

(ii) How can the challenges related to system security be addressed effectively? (4)

Or

(b) (i) Explain the architecture of Body Area Networks (BANs) in detail, highlighting the key components and wireless communication techniques utilized. (8)

(ii) How does the BAN architecture contribute to efficient healthcare monitoring and management? (5)

14. (a) Discuss the working principles of passive smart textiles and provide examples of their applications in everyday life. How it is contributing to enhance user comfort and conveniences?

Or

(b) Explore the various fabrication techniques used in creating smart textiles, including conductive fibers, treated conductive fibers, conductive fabrics, and conductive inks. Compare its advantages, limitations, and suitability for different smart textile applications.

15. (a) (i) Elaborate the latest advancements in medical monitoring patients with chronic diseases. (7)

(ii) How do medical monitoring technologies improves patient outcomes and quality of life? (6)

Or

(b) Discuss the challenges and opportunities associated with neural recording techniques in elderly patients for medical diagnostics and monitoring?

PART C — (1 × 15 = 15 marks)

16. (a) (i) Using the case study of smart fabric for monitoring biological parameters such as ECG and respiration, analyze the integration of sensors, conductive materials, and data processing techniques. (8)

(ii) Discuss the challenges faced in developing smart textiles for healthcare applications and potential future advancements in this field. (7)

Or

(b) Discuss how do hospital patients benefit from integrated monitoring systems, and also outline the role does the technology plays in enhancing healthcare delivery and patient safety within hospital settings. (15)

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