Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 40415

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Fifth/Sixth/Seventh Semester

Civil Engineering

CBM 370 – WEARABLE DEVICES

(Common to : Aeronautical Engineering/Automobile Engineering/Biomedical Engineering/Computer Science and Design/Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer Science and Engineering (Cyber Security)/Computer and Communication Engineering/Electrical and Electronics Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/ Electronics and Telecommunication Engineering/Environmental Engineering/Geoinformatics Engineering/Industrial Engineering/Instrumentation and Control Engineering/Manufacturing Engineering/Marine Engineering/ Materials Science and Engineering/Mechanical Engineering/Mechanical and Automation Engineering/Mechatronics Engineering/Medical Electronics/ Petrochemical Engineering/Production Engineering/Robotics and Automation/ Safety and Fire Engineering/Agricultural Engineering/Artificial Intelligence and Data Science/Bio Technology/Biotechnology and Biochemical Engineering/Chemical Engineering/Chemical and Electrochemical Engineering/Computer Science and Business Systems/Fashion Technology/Food Technology/Handloom and Textile Technology/Information Technology/Petrochemical Technology/Petroleum Engineering/Pharmaceutical Technology/Plastic Technology/Textile Chemistry/Textile Technology)

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A – (10 x 2 = 20 marks)

1. What are wearable systems?
2. State the need for wearable systems in healthcare monitoring.
3. List any two energy harvesting techniques used in wearable devices.

4. Mention one wearability issue associated with the placement of sensors on the body.

5. What is a Body Area Network (BAN)?

6. State why system security is a challenge in wireless health monitoring systems?

7. Define passive smart textile.

8. Give the Applications one fabrication technique used to create conductive fabrics.

9. How neural recording is performed?

10. What is meant by gait analysis?

Part B – (5 x 13 = 65 marks)

11. (a) Analyze the limitations of conventional systems in wearable monitoring and explain how wearable systems address these issues. Provide examples to support your argument

Or

(b) Evaluate the effectiveness of different types of sensors (e.g., inertia movement sensors, respiration activity sensors, impedance plethysmography) used in wearable systems for health monitoring. Discuss their potential applications and limitations.

12. (a) Compare different energy harvesting techniques (Solar, vibration, thermal) used in wearable devices. Discuss the advantages and limitations of each technique.

Or

(b) Assess the impact of sensor design and sampling frequency on the energy consumption of wearable devices. How can these factors be optimized to improve the efficiency of wearable systems?

13. (a) Identify the key challenges associated with the deployment of Body Area Networks (BAN) in healthcare. How can these challenges to overcome to enhance system security and reliability?

Or

(b) Evaluate the different wireless communication techniques used in BAN for healthcare applications. Discuss their suitability for various medical monitoring scenarios.

14. (a) Analyze the fabrication techniques used for creating conductive fibers and fabrics in smart textiles. How do these techniques impact the functionality of the resulting smart textile?

Or

(b) Evaluate the potential of smart textiles in monitoring biological parameters like ECG and respiration. What are the challenges in integrating these functionalities into wearable fabrics?

15. (a) Compare the applications of wearable systems in sports medicine versus medical diagnostics. How do the requirements and functionalities differ between these two fields?

Or

(b) Provide a comprehensive review about the role of wearable devices in chronic disease monitoring and patient care

PART C – (1 x 15 = 15 marks)

16. (a) Design an innovative wearable system for real-time monitoring of multiple physiological parameters (e.g., heart rate, respiration and movement). Justify your choice of sensors, placement and communication protocols used.

Or

(b) Develop a strategy to integrate thermoelectric-photovoltaic energy harvesting in wearable device used for continuous health monitoring. Explain how this approach can address power requirements and improve the device's operational lifespan.