

Roll No



**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
MID TERM EXAMINATION - NOV 2023**

**Semester :** Semester V - 2021

**Course Code :** ECE3063

**Course Name :** Sem V - ECE3063 - Wearable Devices and Its Applications

**Program :** B. TECH

**Date :** 3-NOV-2023

**Time :** 11:30AM - 1:00PM

**Max Marks :** 50

**Weightage :** 25%

**Instructions:**

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

**PART A**

**ANSWER ALL THE QUESTIONS**

**(10 X 1 = 10M)**

1. Wearable Computers are characterized by functional and physical attributes. List at least two physical attributes. (CO1, Remember)  
(CO1) [Knowledge]
2. Steve Mann is considered as the father of wearable technologies. Give the definition of Wearables given by him. (CO1, Remember)  
(CO1) [Knowledge]
3. A concept where two or more machines communicate and perform functions without human interactions are known as .....(Give a single word answer)  
(CO1, Remember)  
(CO1) [Knowledge]
4. Wearable computing could be used for developing advanced robotic applications. List at least two examples of wearables as "Exoskeletons". (CO1, Remember)  
(CO1) [Knowledge]
5. Name the two-word attribute which necessitates the use of wearable computer when a wearable computer which captures gesture of a person and actuates (initiates) certain devices (actions). (CO1, Understand)  
(CO1) [Knowledge]
6. Consider the definition "Wearables as constant and always ready, unrestrictive, not monopolizing of user attention, observable and controllable by the user, attentive to the environment, useful as a communication tool, and personal". Who gave this definition? (CO1, Remember)  
(CO1) [Knowledge]
7. Wearable biosensors are deployed on human to collect various physiological signals. What type of sensors are used based on deployment mode? (CO1, Remember)  
(CO1) [Knowledge]

8. Biosensor is a device used to measure biologically-derived signals. List at least two disadvantages of biosensors. (CO1, Understand) (CO1) [Knowledge]
9. Smart clothing can collect data and either transfer it wirelessly to an external computing unit or process the data itself. List its main function and target groups with an example if being used in sports. (CO1, Remember) (CO1) [Knowledge]
10. Inertial sensors use the property of inertia to measure various types of motion. List the sensor used for capturing angular motion. (CO2, Remember) (CO2) [Knowledge]

## PART B

### ANSWER ALL THE QUESTIONS

(2 X 10 = 20M)

11. One of the major applications of wearables have been in sports. However, designing such devices require a proper research roadmap. Discuss at least five research roadmaps. You should not write more than three sentences for each of the roadmaps. (C.O.NO. - 1) [B.Level – Understand] (CO1) [Comprehension]
12. A building is being constructed in the desert (arid) of “Thar”. The construction workers are subjected to extreme environment conditions. You have been asked to design a protective cum monitoring wearable device for construction workers. Assume that for the sensed parameters, a solution would be provided, comment on the following:  
 (a) Identify the four important vital parameters and their frequency of monitoring.  
 (b) Identify the sensors for each of the cases as in (a)  
 (c) Additionally, which other sensors should be used and why for this scenario?  
 (d) Considering the wearability aspects and the context, what kind of wearable device should be designed?  
 (C.O.NO. - 2) [B.Level - Apply] (CO2) [Comprehension]

## PART C

### ANSWER THE FOLLOWING QUESTION

(1 X 20 = 20M)

13. (A)  
 An inertial system attached to a car starts moving with a non-constant velocity of  $v_x(t) = 2t$  m/s in X direction and  $v_y(t) = 2t - 3$  m/s in Y direction, where t is time. What is the car's location with respect to the origin (X=0, Y=0 i.e. from origin in both directions) after 4 seconds? (C.O.NO. - 2) [B.Level - Apply]
- (B)  
 In order to analyze the gait patterns of an elderly group a research team has collected accelerometer based data which indicate that for a about 40 minutes duration one of the subject set his right foot and the left foot 24 times each (equally spaced). What would be the number of gait step and average step of the elderly person respectively? (C.O.NO. - 2) [B.Level - Apply]
- (C)  
 You are working in a company which design wearables. The project manager has got an assignment for your team to design a system which will be used by young people (aged: 16 – 24 years). He formed two groups of developers/designers, the first one consisting of only male and the second one with only female members. He considers the requirements with respect to design, wearability, usage etc. could be understood in a better way if their group is formed based on gender. Both the groups have to come out with a new wearable i.e. worn by male (to be designed by male group) and worn by female (to be designed by female group). The device **should not** be a traditional health monitoring device (like jacket, wrist-worn), rather it should consider (i) fashion, (ii) function, (iii) wearability (placement location and comfort), and (iv) usage and technological aspects.  
 Do the following:
1. What kind of device you will design (the respective male/female groups)? List out the features and functions of the device that your group is designing.
  2. List the sensors and their utility you are going to have in your design based on the attributes listed from (i) – (iv)
  3. Comment on any specific issues, biases in your opinion which will either help to decrease the marketability or decrease its acceptance if any.
- (Note: Answers will vary for every student)  
 (C.O.NO. - 1) [B.Level - Apply] (CO1,CO2) [Application]