**Project Design Phase-II**

**Technology Stack (Architecture & Stack)**

| Date | 30-07-2025 |
| --- | --- |
| Team ID | PNT2025TMID14372 |
| Project Name | Predictive Pulse: Harnessing Machine Learning for Blood Pressure Analysis |
| Maximum Marks | 4 Marks |

**Technical Architecture:**

## **Project Design Phase-II: Technology Stack**

### 1. **Frontend (User Interface)**

| **Component** | **Technology** |
| --- | --- |
| Framework | **React.js** or **Next.js** |
| UI Library | **Tailwind CSS** or **Material-UI** |
| Charting & Visualization | **Chart.js**, **Recharts**, or **D3.js** |
| Authentication UI | **Firebase UI** / Custom with React |

### 2. **Backend (API & Business Logic)**

| **Component** | **Technology** |
| --- | --- |
| Server Framework | **Node.js with Express.js** |
| Authentication | **JWT (JSON Web Tokens)** / **OAuth 2.0** |
| API Protocol | **REST API** or **GraphQL** |

### 3. **Database**

| **Component** | **Technology** |
| --- | --- |
| User & BP Data Storage | **MongoDB** (NoSQL, scalable) |
| Alternative | **PostgreSQL** (if relational DB is preferred) |

### 4. **Machine Learning / Data Science**

| **Component** | **Technology** |
| --- | --- |
| Data Preprocessing | **Pandas**, **NumPy** |
| Model Training | **Scikit-learn**, **TensorFlow** or **PyTorch** |
| Prediction API | **Flask API** or **FastAPI** (served separately or containerized) |
| Jupyter Notebooks | For experimentation and model evaluation |

### 5. **Integration / Data Sources**

| **Component** | **Technology** |
| --- | --- |
| Device Integration | **Bluetooth APIs**, **Google Fit API**, or **Apple HealthKit** |
| Data Sync | **Webhook** or **Cloud Pub/Sub** (optional) |

### 6. **DevOps & Deployment**

| **Component** | **Technology** |
| --- | --- |
| Version Control | **Git** + **GitHub/GitLab** |
| Containerization | **Docker** |
| CI/CD | **GitHub Actions**, **Jenkins**, or **GitLab CI** |
| Deployment | **Render**, **Heroku**, **Vercel**, or **AWS (EC2/S3)** |
| ML Model Deployment | **FastAPI on Docker** served via **NGINX** or **AWS Lambda** |

### 7. **Security & Compliance**

| **Component** | **Technology** |
| --- | --- |
| Data Encryption | **HTTPS (SSL/TLS)**, **bcrypt** (for password hashing) |
| Compliance | Follow **HIPAA**, **GDPR** standards |
| Role-based Access | **RBAC middleware** in Express or Firebase Auth roles |

### 8. **Testing & Monitoring**

| **Component** | **Technology** |
| --- | --- |
| Testing | **Jest**, **Mocha**, **Postman** (for APIs) |
| Monitoring | **Prometheus + Grafana**, **LogRocket**, or **Sentry** |