Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 120021

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025
Seventh Semester
Biomedical Engineering
U19BMV58– AMBULATORY EQUIPMENTS
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	List the possible artifacts that may occur in a patient monitoring system used in an ambulance.	2	K2	CO1
2.	Define denoising in the context of biomedical signal processing.	2	K2	CO1
3.	State any two advantages of wireless monitoring over wired systems.	2	K2	CO2
4.	Define an ambulance train.	2	K2	CO2
5.	List two safety precautions for handling compressed medical gases.	2	K1	CO3
6.	State the purpose of battery backup in mobile diagnostic equipment.	2	K2	CO3
7.	Mention two advantages of GPS enhanced ambulances.	2	K2	CO4
8.	Name any two communication networks used in GPS-integrated ambulance systems.	2	K2	CO4
9.	Give the fire protection measures used in ambulances.	2	K2	CO5
10.	List the accreditation bodies for ambulance services.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Describe various sources of noise and artifacts in ECG, EEG, and EMG monitoring systems. How do they affect clinical interpretation?	13	K2	CO1

		(OR)			
	b)	With the help of a neat block diagram, explain the functional components of a patient monitoring system. Explain how digital and adaptive filtering techniques are used for artifact removal and signal denoising.	13	K2	CO1
12.	a)	Explain how wearable sensors and IoT-based devices can be used to transmit real-time patient data during transportation. Propose a method or system design to ensure reliable monitoring of vital signs in a moving ambulance or train without signal loss.	13	K3	CO2
		(OR)			
	b)	Explain how a hydraulic or electromechanical lift can safely load patients into an ambulance. Suggest design improvements for minimizing patient discomfort and risk during transport.	13	K3	CO2
13.	a)	Discuss the safe storage, regulation, and delivery of oxygen and other medical gases used in ambulance .	13	K2	CO3
		(OR)			
	b)	Describe the components and working of a mobile X-ray system. Suggest safety measures to protect staff and patients from radiation exposure.	13	K2	CO3
14.	a)	With a neat block diagram, explain the design of a GPS-enabled networked ambulance system. Discuss how automated accident detection and alert mechanisms function and how the system aids in real-time patient care and hospital coordination.	13	K4	CO4
		(OR)			
	b)	Explain the sensor technologies and data flow in an IoT-based accident alert and patient monitoring system.	13	K4	CO4
15.	a)	Elaborate the features and benefits of smart systems (IoT, automated monitoring, predictive alerts) in ambulances or mobile clinics.	13	K2	CO5
		(OR)			
	b)	Describe the process of accreditation for ambulatory healthcare services with reference to NABH / JCI standards.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	A startup offers remote cardiac monitoring services using wearable ECG devices connected to a cloud platform. Data is analyzed automatically and alerts are sent to doctors and patients. The company plans to expand into ambulatory care units but needs accreditation and safety approval.		K2	CO5
		i. Identify the key regulatory challenges for telehealth-based ambulatory services. Discuss the data security and privacy standards applicable.	8		
		ii. Describe the process of obtaining NABH accreditation for such mobile services. Also Suggest how "smart maintenance systems" can ensure continuous, safe operation of devices.	7		
		(OR)			
	b)	A mobile medical unit provides diagnostic, nursing, and telehealth services in rural areas. The unit includes portable ECG, X-ray, and oxygen systems. During an inspection, officials found poor maintenance records, no fire extinguishers, and unqualified staff handling equipment.		K2	CO3
		i. Identify the regulatory and safety violations in this scenario. Recommend a proper maintenance and documentation plan as per NABH standards.	8		
		ii. Outline the fire protection and electrical safety measures that must be implemented. Explain how "telehealth technology" can bridge the skill gap and enhance service quality.	7		