Reg. No.															

Question Paper Code	13894

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Computer Science and Engineering

(Common to Information Technology)

20AIOE910 - HEALTHCARE ANALYTICS

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Healthcare analytics gained importance due to: (a) Growth in unstructured patient data (b) Decline in digital health systems (c) Reduction in medical costs globally (d) Elimination of insurance data	1	K1	CO1
2.	In probabilistic reasoning, uncertainty is handled by: (a) Assigning probability values to events (b) Eliminating random variables (c) Ignoring prior data (d) Fixing deterministic outcomes	1	K1	CO1
3.	Positive Predictive Value (PPV) is also known as: (a) Sensitivity (b) Specificity (c) Precision (d) Recall	1	K1	CO2
4.	In a healthcare analytics pipeline, model training involves: (a) Learning diagnostic or clinical patterns from labeled patient data (b) Visualizing patient trends (c) Cleaning raw medical records (d) Removing duplicate patient entries	1	K1	CO2
5.	What is a major advantage of NoSQL databases in healthcare analytics? (a) Fixed schema structure (b) Scalability and flexibility for heterogeneous data (c) High dependency on relational joins (d) Low storage capacity	1	K1	CO3
6.	Which cryptographic technique the RC6 algorithm,which is for ensuring data confidentiality, is primarily based on? (a) Symmetric key encryption (b) Asymmetric key encryption (c) Hash-based encryption (d) Steganography	1	K1	CO3
7.	Which neural network architecture is primarily used for processing sequential healthcare data such as ECG signals? (a) CNN (b) RNN (c) GAN (d) Autoencoder	1	K1	CO4
8.	Which of the following is an example of descriptive analytics in healthcare? (a) Identifying the most common causes of hospital readmissions (b) Predicting disease outbreak (c) Recommending personalized treatment (d) Detecting real-time anomalies in ECG	1	K1	CO4
9.	Data analytics in HAC programs helps mainly in: (a) Increasing patient turnover (b) Identifying and preventing hospital-acquired infections (c) Improving hospital marketing (d) Managing financial portfolios	1	K1	CO5
10.	Which technology supports remote diagnosis in telemedicine? (a) IoT with Cloud Analytics (b) Virtual Reality (c) 3D Modeling (d) Quantum in Healthcare	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.		List any four important parameters that influence modern medical care systems, particularly in the context of value-based healthcare and data-driven decision making.	2	K1	CO1
12.		Define 'Healthcare Policy' and its role in shaping value-based healthcare systems.	2	K1	CO1
13.		Compare between sensitivity and specificity in evaluating a diagnostic model using integrated patient datasets.	2	K2	CO2
14.		Interpret the meaning of precision and recall in predicting patient outcomes, after building a predictive model on patient datasets.	2	K2	CO2
15.		What is the purpose of a semantic framework in healthcare data analysis?	2	K1	CO3
16.		Define the term "clinical prediction" in healthcare analytics based on structured healthcare data.	2	K1	CO3
17.		Show how data visualization can support decision-making in descriptive and predictive healthcare analytics.	2	K2	CO4
18.		Summarize the importance of biomedical signal analysis in diagnostic healthcare.	2	K2	CO4
19.		Explain about smart ambulance system using IoT improve patient outcomes.	2	K2	CO5
20.		Outline the impact of integrating emerging technologies, including data analytics, on improving healthcare quality, reducing costs and enhancing patient outcomes.	2	K2	CO5
21.		Interpret the role of convolution and pooling layers in convolutional neural networks for analyzing medical images in e-healthcare and telemedicine applications.	2	K2	CO6
22.		Summarize the key components of a clinical decision support system used in critical care and their roles in supporting healthcare data analysis and patient care.	2	K2	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	(i)	Name the commonly used standardized code sets in healthcare data systems.	5	K1	CO1
		(ii)	List the key metrics and parameters in modern medical care systems and their role in supporting data-driven, value-based healthcare.	6	K1	CO1
			OR			
	b)	(i)	List the different types of data formats commonly used in healthcare analytics and their support in data-driven decision-making in value-based healthcare systems.	5	K1	CO1
		(ii)	Show how weighted sum is used in healthcare decision-making to rank treatment options based on multiple patient care criteria such as cost, effectiveness and patient satisfaction.	6	K1	CO1
24.	a)		Explain how healthcare data models can integrate patient information from multiple sources to create comprehensive, patient-centered views, including the steps for finding, extracting, cleaning and performing descriptive analysis on healthcare datasets.	11	K2	CO2
			OR			
	b)		Illustrate the importance of selecting valuable target variables in predictive modeling for healthcare datasets integrated from multiple sources in a clinical decision-support scenario, using an example.	11	K2	CO2
25.	a)	(i)	Define Clinical Prediction Models in healthcare analytics and list three common types.	5	K1	CO3
		(ii)	Recall RC6 encryption and its main features that make it suitable for securing healthcare data during storage and sharing.	6	K1	CO3
			OR			
	b)	(i)	Relate structured and unstructured healthcare data, providing examples for each type along with one practical challenge in handling each type.	5	K1	CO3
		(ii)	List the steps involved in the Matrix Block Cipher System used for healthcare data encryption.	6	K1	CO3

26. a) Explain the process of building a Clinical Decision Support System (CDSS) using deep learning models, by highlighting the key components, workflow and how healthcare data is processed, analyzed and leveraged for predictive decision-making in clinical applications. *11 K2 CO4*

OR

b) Show the workflow of integrating Natural Language Processing (NLP) and data mining techniques to extract meaningful insights from unstructured clinical data. *11 K2 CO4*

27. a) Interpret the challenges encountered in implementing data-driven predictive systems in hospital environments and their impact on healthcare management, particularly with respect to quality of care, cost efficiency and patient outcomes. *11 K2 CO5*

OR

b) Illustrate how combining IoT-enabled patient monitoring and predictive analytics can overcome barriers in emergency medical, optimize patient care and improve outcomes. *11 K2 CO5*

28. a) Model a mobile imaging application for automated skin lesion analysis using a pre-trained CNN model with the given dataset, with data preprocessing in Pandas and model handling in Scikit-learn, highlighting its role in supporting e-healthcare and telemedicine applications. *11 K3 CO6*

Image ID	File Path images/	Patient Age	Gender	Lesion Location	Lesion Type	Diagnosis Label
IMG001	img001.jpg	34	F	Arm	Mole	Benign
IMG002	img002.jpg	45	M	Back	Mole	Malignant
IMG003	img003.jpg	29	F	Face	Freckle	Benign
IMG004	img004.jpg	52	M	Leg	Mole	Malignant
IMG005	img005.jpg	38	F	Arm	Freckle	Benign
IMG006	img006.jpg	60	M	Back	Mole	Malignant
IMG007	img007.jpg	41	F	Leg	Mole	Benign
IMG008	mg008.jpg	50	M	Face	Mole	Malignant

OR

b) Construct a Secure Clinical Decision Support System (SCDSS) module using machine learning or deep learning algorithms with the given patient laboratory data to recommend treatment options in an e-healthcare environment while ensuring patient data confidentiality (through encryption and secure transmission) using appropriate security techniques. *11 K3 CO6*

Patient ID	Age	Gender	Blood Pressure	Blood Sugar	Lipid	Diagnosis	Treatment Recommended
P001	45	M	140/90	180	220	Hypertension	Medication + Diet
P002	30	F	120/80	95	180	Normal	None
P003	65	M	150/95	200	240	Diabetes + Hypertension	Insulin + Medication
P004	50	F	130/85	160	200	Prediabetes	Diet + Exercise
P005	40	M	125/80	110	190	Normal	None
P006	70	F	160/100	220	260	Diabetes +	Insulin +