Reg. No.																

Question Paper Code	14311

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Eighth Semester

Electrical and Electronics Engineering

20EEEL809 - BIG DATA ANALYTICS FOR SMART GRID

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	What is one primary application of satellite communication in power systems? a) Real-time grid monitoring in remote areas b) Increasing dependency on manual inspections c) Reducing power generation capacity d) Causing communication delays	1	K1	CO1
2.	What is a major challenge in integrating renewable energy sources into the power grid? a) High fuel consumption b) Intermittency of power generation c) Lack of environmental benefits d) Increased carbon emissions	1	K2	CO1
3.	Which of the following is a solution to improve grid reliability? a) Use of advanced metering infrastructure b) Dependence on fossil fuels c) Manual grid fault detection d) Ignoring system upgrades	1	K3	CO1
4.	Prescriptive analytics focuses on: a) Data storage b) Decision recommendations c) Data collection d) Data cleaning	1	K1	CO2
5.	Energy forecasting is used for: a) Data deletion b) Load prediction c) File storage d) Encryption	1	K2	CO2
6.	Dynamic pricing depends on: a) Fixed rates b) Only weather c) Only location d) Time and demand	1	K3	CO2
7.	The hidden layer in ANN is responsible for: a) Data printing b) Feature extraction and processing c) Data storage d) Data deletion	1	K1	CO3
8.	NWP helps improve smart grid reliability by predicting: a) Extreme weather events b) System voltage c) Transformer capacity d) Battery storage	1	K2	CO3
9.	Overfitting in ANN occurs when: a) Model learns training data too well b) Model ignores training data c) Data is deleted d) No hidden layers exist	1	K3	CO3
10.	Mixed Integer Linear Programming (MILP) is specifically useful for: a) Continuous variables only. b) Decisions that are discrete, such as turning generators ON/OFF c) Weather forecasting. d) Reducing the volume of big data	1	K1	CO4

11.	What is the primary goal of "Economic Dispatch"?		*1*	*K2*	*CO4*
	a) To build new transmission lines.	b) To increase the amount of data stored in SCADA			
	c) To allocate power generation among available generators to minimize total cost.	d) To monitor the temperature of transformers.			
12.	What is a major challenge of using Big Data Analytics in Online DSA?		*1*	*K3*	*CO4*
	a) Too much stability in the grid.	b) Lack of data from smart meters			
	c) Cyber security risks and high computational requirements	d) Decreased grid complexity			
13.	Which technique is used to reduce noise in smart grid data?		*1*	*K1*	*CO5*
	a) Filtering methods	b) Sorting methods			
	c) Encryption methods	d) Compression methods			
14.	Feature selection helps to:		*1*	*K2*	*CO5*
	a) Increase noise	b) Reduce unnecessary data variables			
	c) Delete databases	d) Increase computation time			
15.	Data imbalance problems can be handled using:		*1*	*K3*	*CO5*
	a) Oversampling techniques	b) Under sampling techniques			
	c) Cost-sensitive learning	d) All of the above			
16.	Random Forest algorithms are often used for:		*1*	*K3*	*CO5*
	a) Fault prediction	b) Text editing			
	c) Data compression	d) Image storage			

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	Identify the major challenges faced by conventional electric grids.	*3*	*K3*	*CO1*
18.	Identify how communication technologies enhance Smart Grid operations.	*3*	*K3*	*CO1*
19.	Utilize prescriptive analytics in smart grid applications.	*3*	*K3*	*CO2*
20.	Model the use of optimization techniques for utility operations.	*3*	*K3*	*CO2*
21.	Interview a grid operator and list possible challenges in short-term load forecasting.	*3*	*K3*	*CO3*
22.	List three common contingencies in a Smart Grid and describe their impact on system security.	*3*	*K4*	*CO4*
23.	Inspect the coordination between Local Damping Controllers (LDC) and Wide Area Damping Controllers (WADC) to manage oscillations.	*3*	*K4*	*CO4*
24.	Analyze machine learning techniques to explain how missing data in smart grid datasets can be handled.	*3*	*K4*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25.	a)	Build a conceptual architecture of a Smart Grid showing generation, transmission, distribution, and communication layers.	*12*	*K3*	*CO1*
		OR			
	b)	Identify the role of PMUs in wide-area monitoring and apply them to enhance system stability.	*12*	*K3*	*CO1*
26.	a)	Apply smart meter data and predictive analytics to design a dynamic pricing model that encourages customers to shift electricity usage to low-demand periods.	*12*	*K3*	*CO2*
		OR			

	b)	Build an analytical model for a smart grid system that uses descriptive and predictive analytics to improve electricity demand forecasting.	*12*	*K3*	*CO2*
27.	a)	Utilize Numerical Weather Prediction (NWP) forecasts in smart grid management.	*12*	*K3*	*CO3*
		OR			
	b)	Develop an ANN model that improves short-term load forecasting accuracy.	*12*	*K3*	*CO3*
28.	a)	Analyze a detailed mathematical framework for Smart Grid scheduling using Deterministic Optimization Methods.	*12*	*K4*	*CO4*
		OR			
	b)	Examine the concept of "Adaptive Protection" by using Intelligent / Adaptive Relays and Intelligent Auto Reclosers (IAR).	*12*	*K4*	*CO4*
29.	a)	Analyze Support Vector Machine (SVM) techniques to design an anomaly detection system for real-time situational awareness in smart grid Big Data Decision Systems (BDDS).	*12*	*K4*	*CO5*
		OR			
	b)	Analyze recurrent neural network (RNN) techniques to design an anomaly detection system for real-time situational awareness in big data decision systems (BDDS) for smart grids.	*12*	*K4*	*CO5*