# Nirma University

## Institute of Technology

Semester End Examination (IR), December 2022

B.Tech. in CH, CL, EC, CSE, IC & ME (Open Elective), Semester – VII

2EEOE03: Introduction to Smart Grid

Roll/ Exam No. | Supervisor's Initial With Date

Time: 3 Hours | Max. Marks: 100

Instructions: -

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable data wherever necessary.
6. Notations used have their usual meaning.

**SECTION- I**

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|---|---|---|---|
| Q-1 (A) | CO1_L3 | Explain basic structure of conventional power system with various specified voltages at different levels using single line diagram. | [4] |
| (B) | CO1_L3 | Describe the opportunities and challenges related to the smart grid. | [6] |
| (C) | CO1_L3 | Compare conventional grid with 21st century smart grid. | [6] |
| Q-2 (A) | CO2_L3 | Discuss the role of smart meter in smart grid. With neat sketch discuss the parameters measured by Smart meter. | [6] |
| (B) | CO2_L3 | Can Electric transportation be seen as a mobile portable power plant? Discuss your views and required technological developments for the same. | [6] |
| | | **OR** | |
| (B) | CO2_L3 | Explain the concept of phasor measurement unit and also mention its applications. | [6] |
| (C) | CO2_L2 | Give the distinct features of air insulated substation and gas insulated substation. | [6] |
| Q-3 (A) | CO3_L3 | Discuss need of vendor proprietary AMI solution. | [4] |
| (B) | CO3_L3 | Discuss various components of SCADA in smart Grid. | [6] |
| | | **OR** | |
| (B) | CO3_L3 | A microgrid is being considered for a university campus area. The microgrid designed shall be capable of operating in islanded mode and grid connected mode. For such a system, suggest whether it shall be a DC microgrid or an AC microgrid. Justify your response. | [6] |
| (C) | CO3_L2 | Discuss the concept of home automation with neat diagram. | [6] |

## SECTION-II

Q-4 (A) CO2_L3 Justify: voltage control is local phenomenon and frequency control is global phenomenon in electrical power system. [4]

(B) CO2_L2 Explain the working of following substation equipment. [6]
I. Current transformer and potential transformer.
II. Circuit breaker
III. Lightning arrester

(C) CO3_L2 Discuss the industry and customer changing scenario with the evolution of smart grid. [6]

**OR**

(C) CO3_L2 Explain the role of area networking in smart grid. Discuss with neat sketch how the data fetched by the utility for billing the consumers. [6]

Q-5(A) CO2_L3 Discuss the different types of renewable energy resources and also mention the advantages and disadvantages of each renewable energy source. [6]

(B) CO4_L2 With neat sketch, discuss various parts of digital relay. [6]

(C) CO4_L2 How is it possible to achieve energy efficiency in electrical systems and power system as a whole using smart grid? Do you think that such energy efficiency not achieved earlier in the absence of "smart" features of the grid? Discuss. [6]

Q-6(A) CO4_L3 Discuss role of sensors in smart grid. [4]

(B) CO4_L3 Discuss the use of ML and AI in context of smart grid. [6]

(C) CO4_L3 Load forecasting sometimes deviate with remarkable change due to unpredicted circumstances. Discuss, how demand side management will take care of the same in such real-time changes. [6]

**OR**

(C) CO4_L3 Enlist various HVDC lines in India. Discuss the merits of HVDC transmission over HVAC transmission. [6]

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