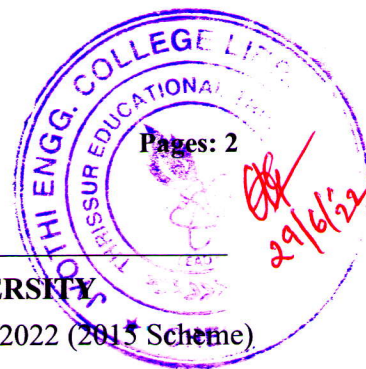


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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Supplementary Examination June 2022 (2015 Scheme)

Course Code: EE403

Course Name: DISTRIBUTED GENERATION AND SMART GRIDS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- 1 Elaborate the major challenges in the deployment of microgrid in Indian scenario. Give suggestions to overcome these challenges. (5)
- 2 Explain how CHP plants can improve the overall efficiency in power generation. (5)
- 3 Discuss the advantages of plug in hybrid electric vehicles over battery electric vehicles in smart grid. (5)
- 4 Explain the role of smart energy efficient end use devices and smart distributed energy resources in smart grid implementation. (5)
- 5 Discuss the various communication technologies that can be used for home area network. (5)
- 6 Explain how feeder automation can improve the reliability of the supply in an electricity grid. (5)
- 7 Discuss the short duration and long duration power quality events with neat illustrations. (5)
- 8 Explain various power quality issues in smart grid. (5)

PART B

Answer any two full questions, each carries 10 marks.

- 9 a) Give the potential benefits of distributed generation. Where do you think the distributed generation systems would have the greatest advantage? (5)
b) Write a note on (i) active power control (ii) reactive power control, and (ii) voltage control in microgrid. (5)
- 10 a) Compare AC and DC microgrids and examine their scope in future power system. (5)
b) Explain the role of Central controller and Microsource controller in Microgrid (5)
- 11 a) Explain the role of battery, ultracapacitor and flywheel in future electricity grid. (5)

- b) With a neat block diagram explain the operation of a grid connected solar PV generation system. (5)

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) With a neat block diagram explain the NIST smart grid reference architecture. (5)
- b) Peak usage and off-peak usage of a customer for a month are 200 kWh and 800 kWh under ToU tariff with peak usage electricity price of Rs. 4/kWh and off-peak price of Rs. 1/kWh. Estimate the electricity charge of the customer for the month. Considering 20% reduction in peak usage under (i) peak shifting and (ii) peak clipping, determine the monthly electricity cost reduction under each of the schemes. (5)
- 13 a) With a neat block diagram elaborate working of smart sensors. (5)
- b) A power station has a maximum demand of 30 MW and a connected load of 50 MW and; the units of energy generated per annum is 70×10^6 kWh. Determine (1) demand factor and (2) load factor. (5)
- 14 a) Discuss any five load shaping methods? (5)
- b) Differentiate between Demand Response (DR) and Demand Side Management (DSM). (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) With a neat block diagram discuss the role of Advanced Metering Infrastructure (AMI) in smart grid implementation. (5)
- b) Explain cloud computing. Propose a cloud architecture for smart grid. (5)
- 16 a) Draw the communication network architecture for smart grid. Discuss the functioning of each component. (5)
- b) A square wave with 50% duty cycle has the Fourier series representation (5)

$$v(t) = \frac{4}{\pi} \sum_{n=1,3,5,\dots}^{\infty} \frac{\sin(2n\pi ft)}{n}$$

Determine the Total Harmonic Distortion (THD) and harmonic Distortion Index (DIN) of the waveform considering upto 7th harmonic component.

- 17 a) With a neat block diagram explain the smart substation architecture. (5)
- b) Discuss in detail any two sources of harmonics and its impact in distribution system. (5)
