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## APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

### Scheme for Valuation/Answer Key

*Scheme of evaluation (marks in brackets) and answers of problems/key*

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 2019

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 Definition(2mark), Any three characteristics(3mark)	(5)
2 Merits and demerits of a solar PV plant	(5)
3 <ul style="list-style-type: none"><li>• Low fault current capacity of inverters</li><li>• Significant reduction in microgrid fault level when transition from grid connected to stand alone mode of operation</li></ul>	(5)
4 Demand factor = Maximum demand / Connected load = 0.65 Average demand = Unit generated per annum / Hours in a year = 10273.9kW Load factor = Average demand / Maximum demand = 0.1976	(2+1+2)
5 <ul style="list-style-type: none"><li>• AMI Host</li><li>• Data Transmission Network</li><li>• Meter Data Management System(MDMS)</li><li>• Communication Network</li><li>• Consumer Data Collection</li></ul>	(5)
6 Challenges- 2 marks <ul style="list-style-type: none"><li>• Interoperability</li><li>• Consumer privacy and security</li></ul> Benefits- 3 marks <ul style="list-style-type: none"><li>• Asserting utility in managing peak load</li><li>• Centralized assess</li><li>• Effectively manage utility grid load</li><li>• Energy optimization by monitoring and controlling energy consumption</li></ul>	(5)
7 Advantages <ul style="list-style-type: none"><li>• On demand self service</li><li>• Broad network access</li><li>• Resource Pooling</li></ul>	(5)



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- Rapid Elasticity
  - Measured service
- 8 SMPS, Three phase power converters, arcing devices, saturable devices, Fluorescent lamps (5)

### PART B

*Answer any two full questions, each carries 9 marks.*

- 9 a) Diagram of router based interconnection(3mark),Explanation(4mark) (7)  
b) Any three functions(3mark) (3)
- 10 a) Sketch (2) + Explanation of various component (4) (6)  
b) Factors which necessitate the development of smart grid technology (4) (4)
- 11 a) Voltage control method in a microgrid with a Q-V diagram-5 (5)  
b) Load frequency control in microgrid with a P-f diagram-5 5

### PART C

*Answer any two full questions, each carries 9 marks.*

- 12 a) Plug in Hybrid Electric Vehicle Technology – Architectures 5  
a. Series Type(Electrical coupling)  
b. Parallel Type(Mechanical coupling)  
c. Series-parallel Type(Both Mechanical & Electrical coupling)
- b) Phasor Measurement Unit(PMU) – 5
- Device that measures the electrical waves on utility grid by employing a general time source for synchronization
  - Synchrophasor
- PMUs in Smart grid –
- Monitoring and control of voltage stability
  - Real time monitoring will improve generation, transmission, distribution and consumption
  - Higher DG penetration
- 13 Load shaping – Modification of load shape by decreasing the consumption 10 during peak period and increasing the consumption during off-peak period
- Peak shaping
  - Valley Filling



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- Load Shifting
  - Strategic Conservation
  - Strategic Load Growth
  - Flexible Load Shape
- 14 a) Role of Technology in Demand response 6
- Block diagram
  - Monitoring the operating parameters through real-time sensors
  - Automatic demand response in times of disturbance
  - AMI system implementation guarantee the DR functionality through connectivity into home via smart meter
  - Two-way AMI networks along with smart meters
- b) Challenges 4
- Consumer – Availability of technology, consumer knowledge, technology cost and financing, consumer inertia and interests
  - Environmental – Strategic load growth, load balancing, rebound effects
  - Utility – increase in complexity, investment recovery issues, little incentive
  - Lack of necessary infrastructure, programme structure(rate & technology), lack of policy support
- PART D**  
*Answer any two full questions, each carries 12 marks.*
- 15 a) Diagram-3 marks, explanation-2 marks(Station level, Bay level, Process level) 5
- b) Diagram-3, explanation – 2(MMS Traffic, GOOSE traffic, SMV traffic) 5
- 16 a) NAN explanation 5
- b) cloud architecture of a smart grid 5
- 17
- Total Harmonic Distortion(THD) 10
  - Telephonic Interference Factor(TIF)
  - Distortion Index(DIN)
  - C-Message Weighted Index

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