

Student Name: Muhammad Asad

Reg. No. 2019-EE-383

### EE456 Smart Grid

Fall 2022, Session 2019 (07<sup>th</sup> Semester) Final-Term Exams

Time Allowed: 90 Minutes

Total Marks: 40

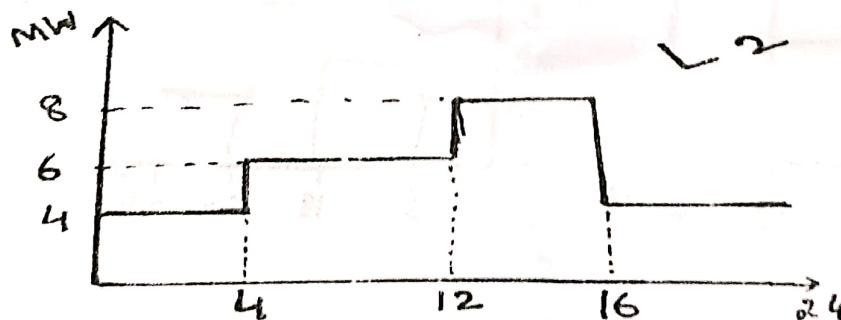
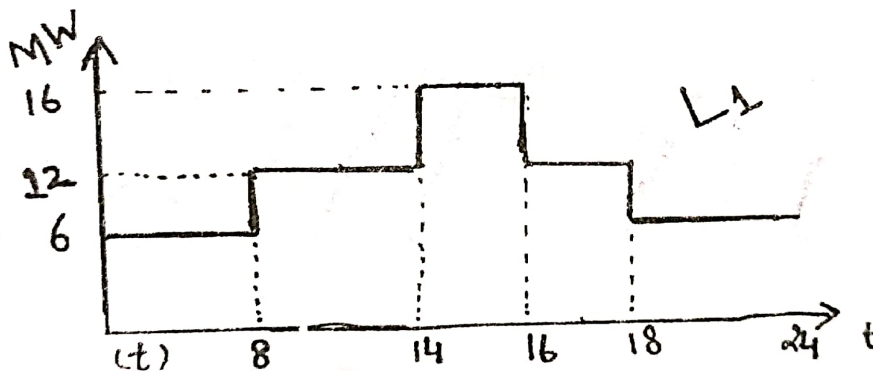
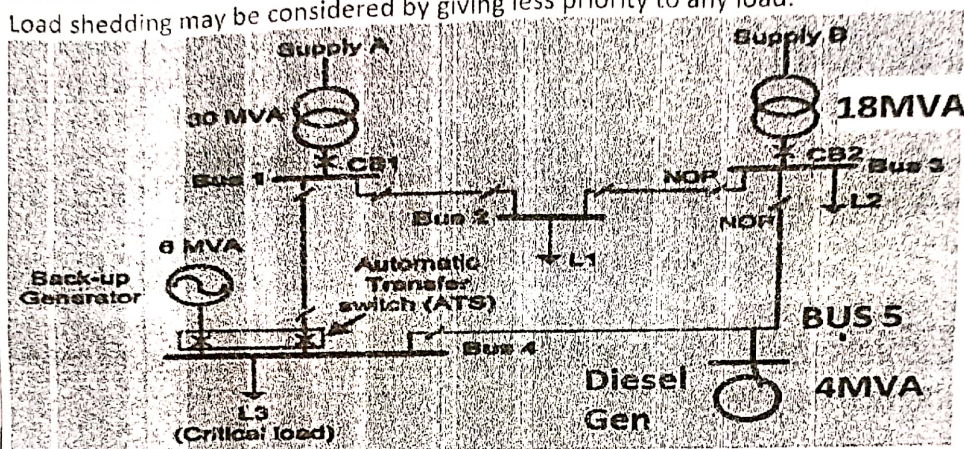
- All the related parts of a question must be solved together.
- Answer should be to the point. Start solution of every new part on a new page.

Q.1 A Outline the maximum restoration scheme which employs an agent and recloser with remote terminal unit that provide minimum interruption to all loads for given scenario?

Supply A is disconnected from system.

Generator at Bus 4 and Bus 5 are costly production generator so it is required that both will run at same time only at critical time.

Load shedding may be considered by giving less priority to any load.

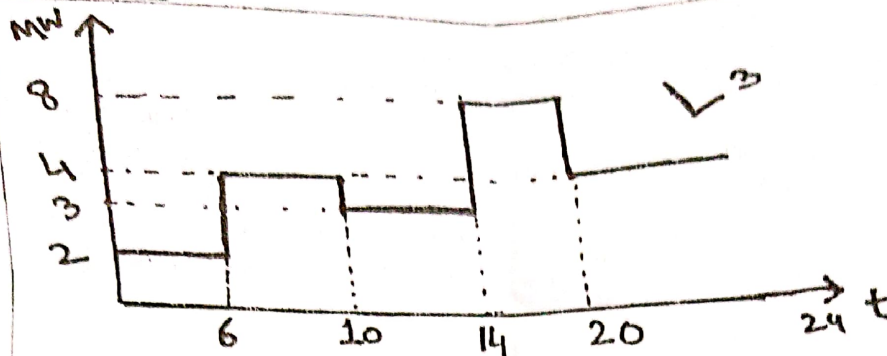


08

PI02  
CI02

Student Name: \_\_\_\_\_

Reg. No. \_\_\_\_\_

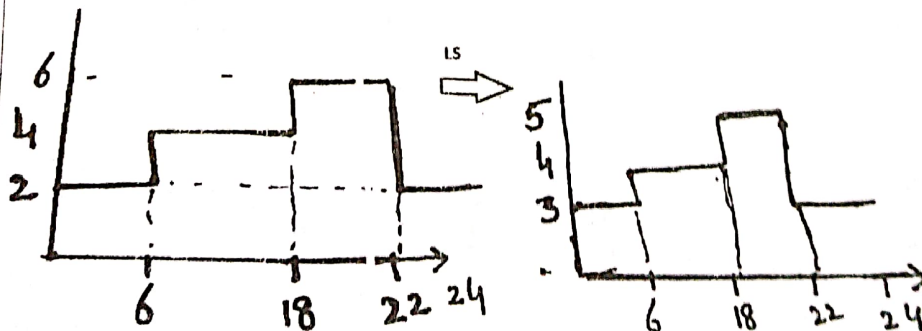
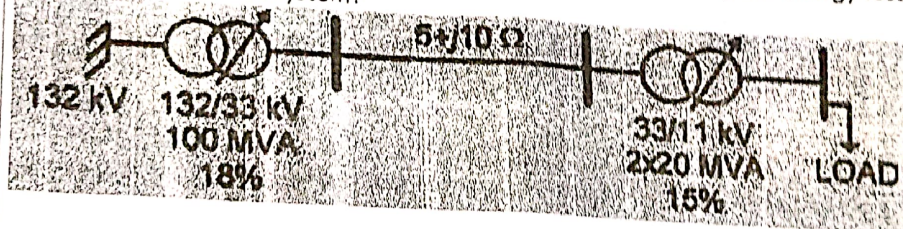


B The electric company in Ireland has decided to modernize the distribution system with some new wind farms and some microgrids, moreover they must mention some additional buses in power flow system either PQ or PV busses by adding these generation units. **Outline** the buses names to these generation units

- Doubly Fed Induction Generator Wind Farm
- Induction Generator Wind Farm
- 100 MW PV generation system
- Multiple Microgrids

The company also want to modernized protection of distribution system in term of reverse current detection also and communication setup must be at least half of pole od distribution setup. **Analyze** the situation and suggest some components?

C Consider the circuit shown in Figure below. The 33/11 kV transformer has an on-load tap changer which maintains the load voltage at 11 kV. Calculate the percentage reduction in energy loss in the 33 kV line If load shifting shown in Figure below is managed. Ignore the 33/11 kV transformer losses? **Compare** energy losses of DSI and without DSI system?



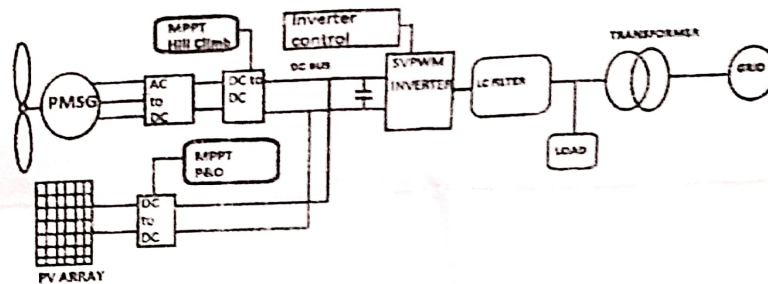


Student Name: \_\_\_\_\_

Q.2 A Draw the control diagram of Grid Tie inverter in Island mode of operation? Outline the equations for  $V_{dref}$  and  $V_{qref}$ ?  
Analyze important factor in DC Microgrid system for power flow in different nano grids within microgrids. 06

B Outline the major advantage of Power electronics converter of Wind Type 4 in term of gearbox system and explain it shortly?  
Also mention the working of stator side converter for Wind Type 3 turbine? *analog* 06

C In the below diagram of hybrid microgrid 10 Kw solar system and 10 Kw wind turbine is integrated with utility grid and load is 20 KW under normal conditions? Draw the waveform of  
• active and reactive power of microgrid  
• active and reactive power of utility grid  
Draw and outline waveform duration is 1 to 10 sec while system is operating at unity power factor in grid tie mode. 08



Case 1: Wind operating at maximum efficiency, PV radiation decrease from 3 to 5 sec causes the decrease of Solar system power from 10KW to 4 KW while load remain constant at 22 KW (1 to 10)?

Case 2: Load set at 28 KW in duration 1 to 10 sec while wind and solar operating at maximum efficiency?

Case 3: Load set at 10 KW in duration 1 to 10 sec while wind and solar operating at maximum efficiency?

Case 4: The inverter is operating and .8 pf according to requirement of delivering reactive power in system in duration 1 to 10 sec while wind and solar operating at maximum efficiency and load is set at 20KW?

PI02  
CI03