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Continuing Education Course #314
Reliability in Mission Critical Applications
Part I – Electrical Systems

1. True or False, "Uptime" is a term that expresses the condition of mission critical systems when they are functioning as required / desired and the services are and continue to be available.

- a. True
- b. False

2. True or False, 1 amp = 1 colomb/minute.

- a. True
- b. False

3. How many Watts of power is calculated on a three phase 120/208 Volt four wire alternating current system for a load of 20 Amps (Note: in 3 phase power calculations, the voltage is measured line to neutral, not line to line)?

- a. 70
- b. 2,400
- c. 7197
- d. Both A & B

4. True or False, AC systems have less losses over great distances than DC systems.

- a. True
- b. False

5. True or False, A transformer changes the voltage of the power passing through it

- a. True
- b. False

6. The following is the name of an electrical component that can be racked out of large switchgear without having to disconnect the wires from lugs:

- a. A fused switch
- b. A main lugs only panel
- c. A manual transfer switch
- d. A draw out breaker

7. What does the "L" typically stand for on the connection point to a transfer switch?

- a. Live
- b. Lifecycle
- c. Lead time
- d. Load

8. True of False, a wraparound bypass ATS is the name of the component capable of being maintained without being shut down for service?

- ○ a. True
- ○ b. False

9. What is the term for transferring the load from the generator back to the utility source without an interruption in power to the load?
- ○ a. Automatic transfer
- ○ b. Open transition
- ○ c. Closed transition
- ○ d. Free range

10. True or False, two (2) utility sources providing power provides less reliability than a single utility source.
- ○ a. True
- ○ b. False

11. The name of a component that converts power from AC to DC and via batteries that can carry the load, back to AC again is referred to as:
- ○ a. A generator
- ○ b. A flywheel UPS
- ○ c. A double conversion UPS
- ○ d. An air conditioner

12. True or False, if a system has a demand load of 1,500 kW and there is a single generator that can provide 1,500 kW, according to the assumptions stated in this course, the system is capable of providing N power?
- ○ a. True
- ○ b. False

13. True or False, if a system has a demand load of 3,500 kW and there are three (3) 1,750 KW generators configured in parallel within a single power train, according to the assumptions stated in this course, is the system providing N+1 power?
- ○ a. Yes
- ○ b. No

14. If the demand load is 1,500 kW, what size do the generators need to be for four (4) paralleled generators to provide N+1 redundancy?
- ○ a. 2,000 kW
- ○ b. 1,000 kW
- ○ c. 500 kW
- ○ d. 1,750 kW

15. If the demand load is 2 MW, How many 250 kW generators are needed in parallel to achieve N redundancy?
- ○ a. 1
- ○ b. 4
- ○ c. 8
- ○ d. 125

16. What is the maximum demand load adequately carried by three (3) 1,750 kW generators installed in parallel in an N+1 configuration in terms of N+1 being the design intent (i.e. what is the redundant capacity of the system)?
- ○ a. 3.5 MW
- ○ b. 5,250 kW
- ○ c. 7,000 kW
- ○ d. 1,750 kW

17. True or False, if a system has no single points of failure it is considered fault tolerant?
- a. True
- b. False

18. True or False, a 2N system as described in this course is considered fault tolerant?
- a. True
- b. False

19. What is the name of a component that creates an ability to connect two panels electrically, which allows some flexibility in the maintainability of a 2N system (Note: this component is not necessarily exclusive to 2N systems)?
- a. shoelaces
- b. a tie or tie breaker
- c. tie fighter
- d. light saber

20. According to this course, what is a major reason to consider a 2N+1 configuration?
- a. it sounds really cool
- b. it's inexpensive
- c. it provides additional redundancy during maintenance
- d. your boss will be impressed with the value added knowledge you bring to the conversation

21. True or False, a multi-module UPS can provide a degree of redundancy in a single powertrain system?
- a. True
- b. False

22. What is the name of the device that can be installed in panel boards to suppress voltage spikes?
- a. The Regulator
- b. TVSS
- c. CCTV
- d. VRLA

23. What is a good way to provide redundancy in the system related to the generator selection and its design.
- a. make sure there is enough fuel in the tank
- b. install a dual fuel source generator
- c. keep an eye on it at all times with security cameras
- d. make sure the fuel vendor will respond within 72 hours

24. True or False, a "Maintainable UPS Design" strategy might be a good way to save day one construction costs but still have some redundancy in the overall power train?
- a. True
- b. False

25. What is the UPS component that converts the DC power from the batteries back to AC?
- a. The Static Switch
- b. The Rectifier
- c. The Transformer
- d. The Inverter