

Unit 8 - Week 7

Register for Certification exam

Course outline

How to access the portal

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

- Lightning protection - Currents, charges and fields
- Lightning Protection - Buildings
- Lightning Protection - Towers, Lightning safety
- Lightning Protection - Exercises
- Week 7 Lecture Material
- Quiz : Assignment 7
- Week - 7 Feedback Form

Week 8

Download videos

Text Transcript

Assignment 7

The due date for submitting this assignment has passed. **Due on 2019-04-17, 23:59 IST**
As per our records you have not submitted this assignment.

- The electric field signature recorded at ground level from an event/s in lightning is shown. What does this represent?
 - A downward leader pulse measured less than 100 m from lightning channel
 - A return stroke measured less than 100 m from lightning channel
 - A leader return-stroke sequence measured more than 10 kilometer from lightning channel
 - A leader return-stroke sequence measured less than 100 m from lightning channel

No, the answer is incorrect.
Score: 0
Accepted Answers:
A leader return-stroke sequence measured less than 100 m from lightning channel
- Several statements related to cloud-to-ground lightning are given. Point out which of them are true
 - i) In a given multiple stroke lightning, the first return stroke is ALWAYS the biggest
 - ii) In a multiple stroke lightning, there CAN be subsequent return strokes whose peaks are higher than the first return stroke
 - iii) In a multiple stroke lightning there CAN be more than one channel to ground below cloud-base, separated by hundreds of meters to a few kilometers
 - iv) In general, a typical positive flash lowers more charge (Coulombs) than a typical negative flash
 - Only i) is TRUE
 - Only i), iii) and iv) are TRUE
 - Only i) and iv) are TRUE
 - Only ii), iii), iv) are TRUE

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only ii), iii), iv) are TRUE
- The total charge in a downward negative cloud-to-ground flash is of the order of
 - 200 milliCoulombs
 - 20 Coulombs
 - 200 Coulombs
 - 2000 Coulombs

No, the answer is incorrect.
Score: 0
Accepted Answers:
20 Coulombs
- The majority of the lightning strike to a tall tower on a high mountain top (e.g., Gaisberg tower in Austria) is initiated by
 - A downward negative leader from cloud
 - An upward negative leader from tower
 - A downward positive leader from cloud
 - An upward positive leader from tower

No, the answer is incorrect.
Score: 0
Accepted Answers:
An upward positive leader from tower
- What is the average optically-measured speed of a typical Stepped Leader and a typical Return Stroke, respectively
 - 50 m/microsecond, 150 m/microsecond
 - 0.2 m/microsecond, 15 m/microsecond
 - 0.2 m/microsecond, 150 m/microsecond
 - 0.02 m/microsecond, 15 m/microsecond

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.2 m/microsecond, 150 m/microsecond
- A lightning flash would strike a grounded structure when:
 - A streamer is initiated from the structure as the downward leader approaches
 - An upward leader initiated from the structure connects the descending stepped leader
 - An upward leader is initiated from the structure as the downward leader approaches
 - Glow corona is initiated from the structure as the downward leader approaches

No, the answer is incorrect.
Score: 0
Accepted Answers:
An upward leader initiated from the structure connects the descending stepped leader
- Let us assume that you are designing the air termination system (with Franklin rods) of the External Lightning Protection System of a structure. Your first design assumes that the structure to be protected can tolerate lightning strikes with return stroke peak currents of up to 16 kA. After a discussion with your client, you realized that the structure is very sensitive and that it cannot stand any lightning strike with prospective return stroke currents larger than 3 kA. Compared with your first design, the number of Franklin rods used in your second design:
 - Decreased
 - Increased
 - Remains the same
 - May decrease or increase depending on the lightning flash density

No, the answer is incorrect.
Score: 0
Accepted Answers:
Increased
- The purpose of grounding system in lightning protection of buildings are as follows. Identify correct statements
 - i) To dissipate lightning current to earth as efficiently as possible,
 - ii) To provide zero-potential reference during lightning
 - iii) To reduce step voltages and thereby reduce risk of personal injury
 - iv) Grounding of buildings is not essential for lightning protection, e.g., refer to aircraft protection
 - Only iv) is true
 - Only ii) is true
 - Only i) and iii) are true
 - Only i), ii) and iii) are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only i) and iii) are true
- What are the main purposes of designing lightning protection for structures? Identify all true statements.
 - i) To reduce the incidence of lightning to the structure
 - ii) To prevent lightning from striking the structure
 - iii) To intercept lightning current and divert it safely to earth without causing any damage to the protected system or personal injury
 - iv) To prevent dangerous spark over within a building and reduce risk of injury to people and prevent damage to equipment
 - Only iii) and iv) are true
 - Only i), iii, and iv) are true
 - Only i) and iii) are true
 - All statements are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only iii) and iv) are true
- Reinforced concrete can be used as part of the down conductor system only if:
 - The concrete is wet during thunderstorms
 - The steel work inside the concrete are securely connected electrically
 - The steel work inside the concrete is externally visible
 - The concrete is made of conductive cement

No, the answer is incorrect.
Score: 0
Accepted Answers:
The steel work inside the concrete are securely connected electrically
- In a lightning protected structure, all metallic parts that can be connected together are connected together at certain points. This is called bonding. What is the Main purpose of bonding
 - To connect all metallic parts to earth (zero) potential during lightning strike
 - To distribute the lightning current between many different paths to ground
 - To avoid overheating and structural damages due to current concentration in some metallic parts
 - To avoid dangerous over voltages and flashovers between various metal parts during lightning strike

No, the answer is incorrect.
Score: 0
Accepted Answers:
To avoid dangerous over voltages and flashovers between various metal parts during lightning strike
- In a particular application, a network operating at 230 V has to be protected against lightning surges. There is a requirement that the overvoltage should not exceed 500 V. Which of the following surge components you would consider to use primarily at the input port of the network?
 - Metal-oxide varistor
 - Gas discharge tube (Spark gap enclosed in ceramic tube with inert gas filled)
 - Zener diode or Avalanche diode
 - Spark gap in air

No, the answer is incorrect.
Score: 0
Accepted Answers:
Metal-oxide varistor
- The construction of a Metal-oxide varistor is usually Zn-O varistor material sandwiched between two round metal plates (like in a parallel-plate capacitor). The current rating of the varistor is primarily depended on
 - The separation distance between the parallel electrodes
 - The grain size of Zinc-oxide elements
 - The diameter of the electrodes
 - Combination of A and C above

No, the answer is incorrect.
Score: 0
Accepted Answers:
The diameter of the electrodes
- Often, a series inductor is used between the primary and secondary stages of surge protection; the primary stage composed of a gas discharge tube (spark gap) and the secondary stage composed of a varistor. What is the main purpose of this series inductor
 - as a series blocking device to reduce the peak surge
 - to make sure that the voltage drop across the spark gap is sufficiently above the spark over voltage
 - to protect the varistor from damage from the initial surge
 - To block high frequencies from the sudden operation of spark gap

No, the answer is incorrect.
Score: 0
Accepted Answers:
to make sure that the voltage drop across the spark gap is sufficiently above the spark over voltage
- In 'hybrid protection' a varistor and gas discharge tube (spark gap) are connected in series across the protected port. Identify the most likely advantage/s of hybrid protection over the use of one component alone
 - Help to extinguish the spark gap when the surge disappears and prevent follow-on currents
 - Reduce the parasitic capacitance
 - Protect the varistor from damage
 - To increase the energy rating

No, the answer is incorrect.
Score: 0
Accepted Answers:
Help to extinguish the spark gap when the surge disappears and prevent follow-on currents
- Shielded cables are used for communication circuits in two physically separated buildings. There are various possibilities to connect the ends of shielded cables, with one possibility as shown in the Figure. What is the best choice considering both reliability and security in normal operation and during lightning surge.
 - Short (connect) both ends of shield to ground as shown in Figure
 - Short one end of shield to ground and leave other end open
 - Leave both ends of shield open
 - Short one end of shield to ground and connect other end to ground through a gas-discharge tube

No, the answer is incorrect.
Score: 0
Accepted Answers:
Short one end of shield to ground and connect other end to ground through a gas-discharge tube
- Can tall communication towers or wind mills increase the incidence of lightning?
 - Yes, it always increases the number of lightning strikes than it would be in the absence of towers
 - Yes, it may or may not depending on the type of thunderstorm, height of the tower or wind mill and the location.
 - Tall towers never increase the number of lightning to an area. It only collects the lightning that would have struck around it in any case (like in a lightning rod)
 - Actually tall towers reduce the incidence of lightning by dissipating corona charges and neutralizing the clouds

No, the answer is incorrect.
Score: 0
Accepted Answers:
Yes, it may or may not depending on the type of thunderstorm, height of the tower or wind mill and the location.
- Pick the correct statements from below regarding electromagnetic field environment from a typical lightning
 - i) Far from lightning, the peak electric field from return stroke varies as inversely proportional to distance
 - ii) The peak lightning field at a distance of 100 m is of the order of 30000 V/m
 - iii) Very close to the lightning, the peak electric field from return stroke varies as inversely proportional to distance
 - iv) On average, the peak of the first return stroke field is double that of the average for subsequent return strokes
 - Only i), ii) and iii) are true
 - Only i), iii) and iv) are true
 - All statements are true
 - Only ii) and iii) are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
All statements are true
- Metallic stripes and edge conductors are provided to tall wind-turbine blades as part of lightning protection. What is the main purpose of this?
 - Blades are made of non-conducting material and therefore lightning may bypass the blades and strike the other parts of turbine where sensitive electronics are situated. Conductors are placed to make the blades like a lightning rod (like on top of a building) to make it the preferred attachment point and protect the rest of the wind turbine
 - When blades are struck by lightning, to prevent blade damage and explosion
 - To prevent damage to wind turbine bearings which are very costly.
 - To protect the control electronics/mechanism inside the blades

No, the answer is incorrect.
Score: 0
Accepted Answers:
When blades are struck by lightning, to prevent blade damage and explosion
- Follow on earth wires can be used in reducing transients carried by a buried communication cable. Pick all correct statements regarding the use of follow-on earth wires from below.
 - i) We need to know from where lightning surge is likely to enter the cable and have galvanic connection between cable shield and follow on earth wire at that side
 - ii) Follow-on earth wire can be another long insulated wire of sufficient cross-section in the same cable trench as the communication cable
 - iii) Follow-on earth wire should be a bare uninsulated conductor of sufficient cross-section buried directly in soil running parallel to the buried cable
 - iv) Follow-on earth wire works best in reducing cable transients where earth conductivity is high
 - All statements are true
 - Only iii) and iv) are true
 - Only i) and iii) are true
 - Only i), iii) and iv) are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only i), iii) and iv) are true

Previous Page

End