Department of Electrical Engineering

Subject: High Voltage Engineering **Semester: VIII**

Unit 1: Conduction and Breakdown in Gases

Q.1	The breakdown criterion in a uniform field electrode gap is
A	$\alpha^{-\gamma d} = 1$
B	$\alpha = \frac{\eta}{(1-\gamma)}$
C	$\gamma e^{ad} = 1$
D	$\gamma e^{-ad} = 1$

Q.2	Electrical conduction in gases was first studied in 1905 by
A	Loeb
B	Maxwell
C	Townsend
D	Hertz

Q.3	An electronegative gas is one in which
A	positive ions are formed along with electrons
B	the gas has inherent negative charge
C	gas is ionized due to electron bombardment
D	the gases in which electron gets attached to form negative ion

Q.4	Ionization coefficients α, γ are functions of
A	applied voltage
B	pressure and temperature
C	electric field
D	ratio of electric field to pressure

Q.5	SF6 is a
A	neutral gas
B	electronegative gas
C	ionizes easily to form ions
D	non-attaching gas

Q.6	According to Townsend current growth process the current (I) in a uniform electric field gap is
A	$I_0 e^{-ad}$
B	$I_0 e^{ad}$
C	$I_0 e^{\gamma d}$
D	$I_0 e^{-\gamma d}$

Q.7	Time lag for breakdown is
A	time difference between instant of applied voltage and occurrence of breakdown
B	time taken for the voltage to rise before breakdown occurs
C	time required for gas to breakdown under pulse application
D	none of the above

Q.8	Streamer mechanism of breakdown explains the phenomena of electrical breakdown of
A	very short spark gaps
B	when pd is less than 1000 torr-cm
C	very long gaps where field is non-uniform
D	spark gaps subjected to impulse voltages

Q.9	Minimum sparking potential of air is about
A	100 V
B	4.4kV
C	40 V
D	325 V

Q.10	Paschen's law states that
A	breakdown voltage is a function of electric field
B	breakdown voltage is a function of pd
C	α and γ depends on E/p
D	electronegative gases have high breakdown voltage

Q.11	For a 1 cm gap in air at 760 mm pressure and 20°C temperature, the breakdown voltage is
A	24kV
B	30.3kV
C	22.92 kV
D	40kV

Q.12	Corona occurs before the breakdown in a sphere to ground air gap when ratio of gap distance to the radius of sphere is
A	>1.0
B	>3.0
C	>10
D	<1.0

Q.13	At standard temperature and pressure the electric field at which breakdown occur in air with a small gap d (cm) is given by
A	30 + 6.08/d
B	24.2 + 6.08/d
C	$24.2+6.08/\sqrt{d}$
D	$30d[1+\frac{0.301}{\sqrt{d}}]$

Q.14	The mechanism of breakdown in vacuum is due to
A	particle exchange
B	field emission
C	clump formation
D	all of the above

Q.15	The requirement of gases for insulation purpose is
A	high dielectric strength and thermal stability
B	high dielectric strength only
C	high thermal stability
D	high thermal stability and low temperature condensation

Q.16	Which of the following gas is a electronegative gas?
A	Air
B	O_2
C	SF_6
D	Both O_2 and SF_6

Q.17	The breakdown voltage of a spark gap for impulse voltage_____is compared to the breakdown voltage of power frequency ac
A	same
B	larger
C	smaller
D	cannot be predicted

Q.18	SF_6 has the following property which is not favourable for use in electrical apparatus:
A	High dielectric strength
B	High are quenching ability
C	It is not environmental friendly and causes global warming
D	None of the above

Q.	The breakdown voltage of gas or air with increase in pressure under uniform field has_____relation with pressure
A	almost linear
B	square
C	non-linear
D	reciprocal

Q.19	Among the common gases that are used for electrical insulation, which gas has the highest breakdown strength at atmospheric pressure?
A	Air
B	Nitrogen
C	SF_6
D	Oxygen

Q.20	Paschen's law is associated with
A	breakdown voltage
B	ionization
C	thermal radiations
D	none of the above.

Q.21	The essential condition for the Paschen's law to be valid is that
A	voltage must be dc
B	voltage must be ac
C	temperature must be constant
D	humidity must be low

Q.22	The breakdown voltage in gases depends on
A	distance between the electrodes
B	relative air density
C	humidity
D	all of the above.

Q.23	At unvarying temperature breakdown voltage in a uniform field is a function of the product of gas pressure and distance between the electrodes. The above statement is known as
A	Electron avalanche
B	Thermal stability principle
C	Paschen's law
D	Breakdown voltage law

Q.24	Townsend's first ionization coefficients define as
A	Maximum number of ionizing collisions made by an electron per centimeter travel in the direction of field
B	Minimum number of ionizing collisions made by an electron per centimeter travel in the direction of field
C	Average number of ionizing collisions made by an electron per centimeter travel in the direction of field
D	Maximum number of ionizing collisions made by an electron per millimeter travel in the direction of field

Q.25	If the Breakdown occurred when the gap distance was 0.9 cm and α was 0.767/torr-cm, what is the value of γ?
A	1×10^{-4}
B	1.5×10^{-4}
C	1×10^{-5}
D	2×10^{-4}

Q.26	Townsend's first ionization coefficients A depends upon (T=gas temperature , p= gas pressure, E= voltage across gas medium)
A	T
B	p
C	E/p
D	p and E/p

Q.27	The secondary ionization coefficient Γ is define as the net number of secondary electrons produced per incident of
A	Positive ion
B	Photon
C	Excited particles or meta stable particles
D	All off above

Q.28	The total current as per townsend's theory is (if I_0= initial current due to cathode, α = First ionization coefficient, Γ = Secondary ionization coefficient)
A	$\frac{I_0 e^{\alpha d}}{1-\gamma(e^{\alpha d}-1)}$
B	$\frac{I_0 e^{\alpha d}}{1-\gamma(e^{\alpha d})}$
C	$\frac{I_0 e^{\alpha d}}{e^{\alpha d}-\gamma-1)}$
D	$\frac{I_0 e^{\alpha d}}{\gamma-1}$

Q.29	In an experiment in a certain gas, It was found that the steady state current is 5.5×10^{-8} A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A then find the value of townsend's first ionization coefficient α
A	5.5/cm-torr
B	6.6/cm-torr
C	7.6/cm-torr
D	1/cm-torr

Q.30	The breakdown criteria for electronegative gases is
A	$\alpha = \gamma$
B	$\alpha = \eta$
C	$\gamma = \eta$
D	$\alpha = 1+\eta$

Q.31	Limitation of townsend's theory is
A	Current growth due to ionization only while in practice depends on gas pressure and geometry of the gap
B	Time lag is 10^{-5}second which is very short of 10^{-8} second in real
C	Diffused type of discharge which is actually filamentary or irregular type
D	All of the above

Q.32	The streamer theory suggests that when the charge concentration is _____ 10^{8} then breakdown occurs.
A	Less than
B	Higher than
C	Equal to
D	Not

Q.33	For high voltage transmission line, Corona is responsible of
A	Power losses and deterioration of insulation
B	Improve receiving end voltage
C	Create fault condition
D	Improve reliability

Q.34	The requirement of gases for insulation purpose is
A	High dielectric strength and thermal stability
B	High dielectric strength only
C	High thermal stability
D	High thermal stability and low temperature condensation

Q.35	The streamer theory explain the breakdown when
A	*pd* is less than or equal to 1000 torr-cm
B	*pd* is more than 1000 torr-cm
C	*pd* is between 100 torr-cm to 1000 torr-cm
D	Pressure is upto 300 torr

Q.36	The mechanism of breakdown in vacuum is due to
A	Particle exchange
B	Field emission
C	Clump formation
D	All of the above

Q.37	Visual appearance of corona under positive polarity of applied voltage is
A	Uniform bluish white sheath over the entire surface of conductor
B	Reddish glowing Spots distributed along the length of wire
C	Yellowish glowing spots distributed along the surface of conductor
D	None of the above

Q.38	One of the drawback of SF_6 gas for use as insulation is
A	High dielectric strength
B	Low liquefaction temperature
C	Arc quenching properties
D	Greenhouse gas

Q.39	Dielectric breakdown occurs in gases due to _____
A	Corona Discharge
B	Dielectric heating
C	Intrinsic breakdown
D	Defect breakdown

Q.40	According to the Paschen's Law, the breakdown voltage of a uniform field gap is
A	Directly proportional to the gas pressure and inversely proportional to the electrode gap
B	Inversely proportional to the gas pressure and directly proportional to the electrode gap
C	Directly proportional to the both electrode gap and gas pressure
D	Inversely proportional to the both electrode gap and gas pressure

Q.41	For the high voltage conductors at high pressures, if the voltage is positive then the corona appears as a
A	Uniform bluish white sheath
B	Reddish glowing spots
C	Uniform greenish spots
D	None of these

Q.42	A gas in normal state is almost a perfect
A	Conductor
B	Insulator
C	Semi-conductor
D	Dielectric

Q.43	Which theory explains the mechanism for breakdown under different conditions?
A	Townsend theory
B	Streamer theory
C	Clump theory
D	Only (a) and (b)

Q.44	The Townsend mechanism explains the phenomenon of breakdown
A	Only at low pressure
B	Only at high pressure
C	Only at very high pressure
D	Only bat very low pressure

Q.45	Which of the following statement about corona is incorrect?
A	Corona gives rise to radio interference
B	Corona results in loss of power in transmission
C	Corona discharge can be observed as red luminescence
D	Corona is always accompanied by a hissing noise

Q.46	What are the physical conditions governing ionization mechanism in gases dielectrics?
A	Nature of electrode surface
B	Temperature
C	Pressure
D	All of the above

Q.47	What are the various factors affecting B.D. in vacuum medium
A	Gap length
B	Geometry & material of electrode
C	Presence of extraneous particles & residual gas pressure in the gap
D	All of the above

Q.48	What are the characteristics of corona discharge
A	Air surrounding the corona becomes converted to ozone
B	It causes deterioration of the insulation surface.
C	Gap length
D	Both (a) and (b)

Q.49	…….are collisions which when occur, no change takes place in the internal energy of the particles but only their kinetic energy gets redistributed.
A	Inelastic collision
B	Electric collision
C	Air collision
D	Elastic collisions

Q.50	When particles possessing energy, which is exhibited as a random motion, are distributed unevenly throughout a space, then they tend to redistribute themselves uniformly throughout the space. This process is known as ……..
A	Collision
B	Ionization
C	Diffusion
D	None of the above

Q.51	The process of liberating an electron from a gas molecule with the simultaneous production of a positive ion is called……..
A	Collision
B	Ionization.
C	Separation
D	Interaction

Q.52	A…… is used to create vacuum is a system in which the pressure is maintained at a value much below the atmospheric pressure.
A	vacuum system
B	Gaseous system
C	Chamber system
D	Air system

Q.53	What are the different mechanism used for breakdown in vacuum
A	Particle exchange mechanism
B	Field emission mechanism
C	Clump theory
D	All of the above

Q.54	What will be the breakdown voltage of a spark gap in a gas at pr = 760 torr at 25°C if A = 15/cm, B = 360/cm, d = 1 mm and $\gamma = 1.5 \times 10^{-4}$?
A	5626 volts
B	5525 volts
C	5462 volts
D	5620 volts

Q.55	What is the critical threshold distance for sustained discharge if α = 2.43/cm and $\gamma = 6.823 \times 10^{-4}$
A	1 cm
B	2 cm
C	3 cm
D	4 cm

Q.56	In a gas,the steady state current is 5.5×10^{-8} A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α.
A	7.676 / cm torr
B	7.456 / cm torr
C	7.356 / cm torr
D	7.567 / cm torr

Q.57	What will the breakdown strength of air be for small gaps (1 mm) and large gaps (20 cm) under uniform field conditions and standard atmospheric conditions?
A	42.24 kV/cm, 20.52 kV/cm
B	43.45 kV/cm, 25.58 kV/cm
C	41.52 kV/cm, 22.61 kV/cm
D	43.25 kV/cm , 25.22 kV/cm

Q.58	For a certain gap with uniform field electrodes, α was 7.676 /cm with a gap distance of 0.9 cm before breakdown. What will be the secondary ionization coefficient γ?
A	9.521×10^{-4}
B	9.876×10^{-4}
C	9.78×10^{-4}
D	9.993×10^{-4}
Ans.	D

Q.59	What is the minimum spark-over voltage of the above gap, if A = 15/cm, B = 360/cm, γ = 1.5×10^{-4} , e= 2.178 .
A	450 V
B	460 V
C	465 V
D	455 V

Q.60	What is the critical threshold distance for sustained discharge if α = 2.75/cm and γ = 4.823×10^{-4}.
A	2.78 cm
B	2.51 cm
C	2.62 cm
D	2.42 cm

Unit 2: **Conduction and Breakdown in Solid and Liquid dielectrics, insulating materials**

Q.61	Breakdown due to internal discharges develops
A	in milliseconds
B	in few seconds
C	over a long duration of several days
D	all the above

Q.62	Electrochemical breakdown and deterioration of insulating material is due to
A	temperature rise
B	oxidation, hydrolysis or some other chemical action
C	only due to hydrolysis and moisture effects
D	none of the above

Q.63	Aging in electrical insulating materials under an electrical field means
A	gradual reduction in dielectric strength which may lead to breakdown
B	decrease in insulation resistance of the materials
C	progressive building up of disruptive discharges inside the material
D	all the above

Q.64	In a pure liquid dielectric, with the increase in hydrostatic pressure, the breakdown stress
A	increases linearly up to some extent and does not change afterwards
B	increases exponentially
C	decreases
D	none of the above

Q.65	The maximum breakdown strength that can be obtained with pure liquids like hexane is about
A	1 MV/cm
B	100 kV/cm
C	250 to 300 kV/cm
D	10 MV/cm

Q.66	For good insulating oil, the power factor or tan 'δ' at the given frequency of application should be
A	0.1
B	less than 10^{-3}
C	10^{-2} to 10^{-3}
D	10^{-1} to 10^{-2}

Q.67	Which of the following property is important for a liquid to be used both for electrical insulation and cooling purposes?
A	Thermal conductivity
B	Viscosity
C	Viscosity temperature characteristic
D	Breakdown strength

Q.68	Which of the following liquids has highest breakdown strength?
A	Mineral oils
B	Silicone oils
C	Chlorinated hydrocarbon oils
D	Polyolefins or esters

Q.69	The parameters that affect the breakdown strength of liquids is
A	hydrostatic pressure and temperature
B	dissolved impurities
C	dielectric constant
D	pressure, temperature, dissolved impurities and suspended particles

Q.70	Stressed oil volume theory is applicable when
A	small volume of liquid is involved
B	large volume of liquid is involved
C	large gap distance is involved
D	pure liquids are involved

Q.71	The relation between breakdown strength and gap distance in liquid dielectrics is Vb
A	K/d
B	Kd^{n}
C	Kd^{-n}
D	$(K_1d + K_2)$

Q.72	Conduction and breakdown in commercial liquids is affected by
A	solid particles
B	vapour or air bubbles
C	electrode material
D	all the above three factors a, b and c

Q.73	Maximum dielectric strength obtained with pure liquids is about
A	100 kV/mm
B	10 kV/mm
C	1 MV/mm
D	50 kV/mm

Q.74	DC conductivity of liquid dielectrics at low electric fields is about in Siemens
A	10^{-6}
B	10^{-12}
C	10^{-18}
D	10^{-30}

Q.75	Dielectric constant of mineral oils is about
A	1.5 to 2.0
B	2.2 to 2.4
C	3.0 to 3.5
D	1.008

Q.76	tan δ for liquid insulants at 50 Hz should be less than
A	0.1
B	0.01
C	0.001
D	10^{-6}

Q.77	The breakdown strength of mineral oil is about
A	20 kV/mm
B	50 kV/mm
C	3 to 5 kV/mm
D	30 to 40 kV/mm

Q.78	Transformer oil is
A	askeral
B	silicone oil
C	polyester
D	mineral oil

Q.79	The intrinsic breakdown strength of solid dielectrics is about
A	50 to 100 kV/mm
B	500 to 1000 kV/mm
C	5 to 10 kV/mm
D	1 to 5 kV/mm

Q.80	The usual mechanism of breakdown in solid dielectrics is
A	intrinsic breakdown
B	electromechanical breakdown
C	thermal breakdown
D	chemical breakdown

Q.81	Long-term deterioration and breakdown occurs in solid dielectrics due to
A	thermal phenomenon
B	surface discharges
C	internal discharges
D	treeing phenomenon

Q.82	Paper insulation is mainly used in
A	cables and capacitors
B	transformers
C	rotating machines
D	circuit breakers

Q.83	Thermal classification of insulating materials is done for
A	gases
B	liquids
C	solids
D	composite insulation

Q.84	Breakdown is permanent in
A	gases
B	liquids
C	solids
D	in all the three

Q.85	The material used for insulation that is exposed to atmosphere is
A	ceramics and glass
B	polyesters
C	inorganic insulation
D	rubber and plastics

Q.86	For high frequency applications the following plastic is preferred
A	polyethylene
B	polyvinyl chloride (PVC)
C	polyester
D	polystyrene

Q.87	The operating temperatures of polyethylene insulation is
A	−30° to 50°
B	−60° to 150°
C	−50° to 80°
D	0° to 100°

Q.88	Epoxy resins are used as insulation when
A	composite insulation is required
B	when cast in insulation mould is required
C	for very high temperature applications are needed
D	filler materials are required

Q.89	Electromechanical breakdown occurs when the thickness due to electrical stress is compressed or reduced to about
A	0.9
B	0.8
C	0.7
D	0.6

Q.90	Thermal breakdown occurs when the heat generated inside the insulating material is
A	equal to or greater than the heat dissipated
B	less than that the heat generated from the surface
C	only under ac voltage application
D	none of the above

Q.91	A solid specimen of dielectric has a dielectric constant of 4.2, and tan δ = 0.001 at a frequency of 50 Hz. If it is subjected to an alternating field of 50 kV/cm, calculate the heat generated in the specimen due to the dielectric loss.
A	0.2 mW/cm^3
B	0.291 mW/cm^3
C	0.189 mW/cm^3
D	0.25 mW/cm^3

Q.92	The presence of even 0.01% of water in transformer oil reduces its electrical strength of _____% then the dry transformer oil
A	50
B	20
C	30
D	80

Q.93	Pure liquids are those which are chemically pure and do not contain any impurities in even in the traces of 1 in _____
A	10^5
B	10^{10}
C	10^9
D	10^4

Q.94	Example of pure liquid dielectric is
A	Silicon oil
B	Chlorinated Hydrocarbon
C	N-hexane
D	Tetrachloroethylene

Q.95	In purification of liquid dielectric, the following process is used to remove dust
A	Distillation
B	Filtration
C	Degassing
D	Chemical treatment

Q.96	Which of the filter used to remove dust from liquid dielectric
A	Chemical filter
B	Vacuum filter
C	Mechanical, spray and electrostatic filter
D	Multilayer filter

Q.98	Moisture and dissolved gases in liquid dielectric is remove with the help of
A	Distillation and degassing
B	Filtration
C	Chemical treatment
D	None of the above

Q.99	Vacuum drying in liquid purification system remove
A	Dust
B	Chemical
C	Moisture
D	Water vapour

Q.100	Breakdown test mechanism of liquid dielectric required source voltage of
A	20-40 kV
B	50-100 kV
C	100-150 kV
D	Above 150 kV

Q.101	Dimension (L × W × H in mm) of test cell of breakdown test of liquid is
A	55 × 90 × 100
B	50 × 100 × 100
C	55 × 100 × 100
D	40 × 90 × 100

Q.102	Conduction and breakdown in commercial liquids is affected by
A	Solid particles
B	Vapour or air bubbles
C	Electrode material
D	All of above

Q.103	Stressed oil volume theory is applicable when
A	Small volume of liquid is involved
B	Large volume of liquid is involved
C	Large gap distance is involved
D	Pure liquids are involved

Q.104	The parameters that affect the breakdown strength of liquids is
A	Hydrostatic pressure and temperature
B	Dissolved impurities
C	Dielectric constant
D	Pressure, temperature, dissolved impurities and suspended particles

Q.105	Which of the following liquids has highest breakdown strength?
A	Mineral oils
B	Silicone oils
C	Chlorinated hydrocarbon oils
D	Polyolefins or esters

Q.106	Which of the following property is important for a liquid to be used both for electrical insulation and cooling purposes?
A	Thermal conductivity
B	Viscosity
C	Viscosity temperature characteristics
D	Breakdown strength

Q.107	when voltages are applied only for short duration of the order of 10^{-8}, the dielectric strength of solid dielectric increases very rapidly to an upper level is called
A	Electromechanical breakdown strength
B	Thermal breakdown strength
C	Intrinsic breakdown strength
D	Treeing and tracking

Q.108	The highest electromechanical breakdown strength is (If Y= young modulus, ε_0= absolute permittivity, ε_r= relative permittivity, d_0= thickness of specimen before compressed,d= thickness of specimen after compressed)
A	$0.6\ (\frac{Y}{\varepsilon_0\varepsilon_r})^{\frac{1}{2}}$
B	$\varepsilon_0\varepsilon_r\ \frac{V^2}{2d^2}$
C	$Y\ \ln[\frac{d_0}{d_1}]$
D	None of the above

Q.109	Solid specimen of dielectric has a dielectric constant of 4.2, and tan δ = 0.001 at a frequency 50 Hz.If It is subjected to an alternating field of 50 kV/cm, Calculate heat generated in the specimen due to dielectric losses.
A	1 mW/cm^3
B	0.291 mW/cm^3
C	0.4 mW/cm^3
D	0.6 mW/cm^3

Q.110	The thermal breakdown stress is _____ for ac fields then dc fields
A	Moderate
B	High
C	Low
D	Equal

Q.111	The effect of electrochemical and chemical deterioration could be minimized by
A	Reduces dust particle
B	Reduces moisture
C	Reduces temperature
D	All of above

Q.112	Long-term deterioration and breakdown occurs in solid dielectrics due to
A	Thermal phenomenon
B	Surface discharges
C	Internal discharges
D	Treeing phenomenon

Q.113	Thermal breakdown occurs when the heat generated inside the insulating material is
A	Equal to or greater than the heat dissipated
B	Less than that heat generated from the surface
C	Only under AC voltage application
D	None of the above

Q.114	Treeing and tracking is prevented by
A	Low temperature
B	Clean,dry and undamaged surfaces and clean environment
C	Reduced loading
D	No means

Q.115	Breakdown due to internal discharges develops
A	In milliseconds
B	In few seconds
C	Over a long duration of several days
D	All of the above

Q.116	Composite dielectric is define as
A	Mixture of solid and liquid insulating material
B	Mixture of solid and gas insulating material
C	Mixture of gas and liquid insulating material
D	Different insulating material connected in series and parallel

Q.117	Composite dielectric is widely used in high voltage electrical system to
A	Reduced the cost
B	Reduced the temperature effect
C	Reduced the humidity effect
D	Obtain superior dielectric strength

Q.118	Composite dielectric breakdown mechanism is define by
A	Short term breakdown
B	Ageing and breakdown due to partial discharges
C	Aging and breakdown due to accumulation of charges on insulator surfaces
D	All of above

Q.119	The insulating material which forms an insulator of any desired shape for almost any kind of high voltage application
A	Epoxy Resins
B	Bakelite
C	Elastomers
D	Melamine

Q.120	The most commonly used liquid for transformer insulation is
A	mineral oil
B	askerals
C	silicone oil
D	polyester oils

Q.121	For generator coil insulation the class of insulation used is
A	class A
B	class B
C	class C
D	class F

Q.122	The insulation used in high voltage circuit breakers of large power rating is
A	air
B	vacuum
C	SF6
D	mineral oil

Q.123	For HV cable insulation, the materials used are
A	glass and ceramic
B	silicone rubber
C	XLPE
D	paper-oil insulation

Q.124	Askerals are not used as transformer or capacitor insulation in recent years because
A	it has less dielectric strength
B	its density and dielectric constant are high
C	it decomposes easily giving out toxic gases
D	it is highly flammable

Q.125	Gas insulation is nowadays used in
A	generators
B	motors
C	transformers
D	circuit breakers and substations

Q.126	Synthetic liquid dielectrics are mainly used in
A	capacitors and cable insulation as impregnate
B	In transformer insulation
C	In circuit breakers
D	all the three above a, b, and c

Q.127	Resins and varnishes are mainly used for
A	transformer coil impregnation
B	Generator and motor coil impregnation
C	In cable and capacitor insulation
D	overhead line insulation

Q.128	For high temperature applications such as few motor or generator coils with class F or H insulation the materials used are
A	Polymer films (Mylar, etc.)
B	Polyester films
C	Glass fibre reinforced epoxy or polyester films
D	PTFE or PXE films

Q.129	In high-voltage switch gear, the insulation used inside the breaker (arc chambers) is
A	Epoxy resin
B	Porcelain
C	Vulcanized
D	Fibre and resin bonded glass fibre

Q.130	When voltages are applied only for short durations of the order of 10−8 s, the dielectric strength of a solid dielectric increases very rapidly to an upper limit called……...
A	intrinsic electric strength
B	extrinsic electric strength
C	Breakdown strength
D	Both a) and b)

Q.131	……is the formation of a continuous conducting paths across the surface of the insulation mainly due to surface erosion under voltage application.
A	Tracing
B	Treeing
C	Tracking
D	Trekking

Q.132	The different materials can be in parallel with each other, such as air or SF6 gas in parallel with solid insulation or in series with one another. Such insulation systems are called……
A	Insulation
B	Composite dielectrics
C	Mixed dielectric
D	Solid dielectric

Q.133	The spreading of spark channels during tracking, in the form of the branches of a tree is called……..
A	treeing
B	tracking
C	lightening
D	flashover

Q.134	Which are the properties of composite dielectrics?
A	Effect of Multiple Layers
B	Effect of Layer Thickness
C	Effect of Interfaces
D	All of the above

Q.135	What is the temperature limit for class F insulating material?
A	105^0C
B	155^0C
C	120^0C
D	130^0C

Q.136	Mica, fibreglass (alkali free alumino borosilicate), bitumenized asbestos, Bakelite, polyester enamel are the example of ……...insulating materials.
A	Class Y
B	Class C
C	Class E
D	Class B

Q.137	What is the temperature limit for class C insulating material?
A	155^0C
B	Above 180^0C
C	180^0C
D	120^0C

Q.138	What are the electrical properties of liquid dielectrics?
A	relative permittivity
B	loss tangent (tan δ)
C	withstand high electric stresses
D	All of the above

Q.139	A solid specimen of dielectric has a dielectric constant of 4.2, and tan δ = 0.001 at Download From: www.cgaspirants.com a frequency of 50 Hz. If it is subjected to an alternating field of 50 kV/cm, calculate the heat generated in the specimen due to the dielectric loss.
A	0.291 mW/cm^3
B	0.251 mW/cm^3
C	0.241 mW/cm^3
D	0.841 mW/cm^3

Q.140	What is the temperature limit for class Y insulating material?
A	90^0C
B	130^0C
C	155^0C
D	180^0C

Q.141	The electrical breakdown strength of insulating materials depends on
A	nature of applied voltage
B	imperfections in dielectric material
C	pressure, temperature and humidity
D	all of the above.

Q.142	Which of the following gas has been used as insulating medium in electrical appliances?
A	Nitrogen
B	Carbon dioxide
C	Sulphur hexafluoride
D	Freon

Q.143	Electro-mechanical breakdown of solid insulating materials occurs due to
A	magnetic bum
B	vibrations
C	mechanical stresses produced by the electrical field
D	electrical stresses produced by the voltage fluctuations

Q.144	Liquids are generally used as insulating materials up to voltage stresses of about
A	100 MV/cm
B	50 MV/cm
C	50 kV/cm
D	500 V/cm

Q.145	What is the temperature range for class A insulating material?
A	90^0C
B	105^0C
C	120^0C
D	130^0C

Q.146	How should the properties of strength and dielectric strength in insulating materials?
A	High strength, low Dielectric strength
B	Low strength, low Dielectric strength
C	High strength, high Dielectric strength
D	Low strength, high Dielectric strength

Q.147	What is the temperature limit for class B insulating material?
A	180^0C
B	105^0C
C	130^0 C
D	90^0C

Q.148	What is the other name of Polymer Insulator?
A	Moisture insulator
B	Core insulator
C	Composite insulator
D	Mixed insulator

Q.149	The insulating material for cable should have
A	Low cost
B	High dielectric strength
C	High mechanical strength
D	All of the above

Q.150	Which of the following insulation is used in cable?
A	Varnished cambric
B	Paper
C	rubber
D	Any of the above

Q.151	The commonly used materials for HV insulations is
A	Paper-oil insulation
B	Polyester resin
C	Ceramic
D	PVC

Q.152	Resins and varnishes are commonly used in
A	Generators and motors
B	Cables
C	Transformers
D	Circuit breakers

Q.153	he resin bonded paper bushings are designed to operate at a maximum radial stress of
A	5 kV/cm
B	10 kV/cm
C	15 kV/cm
D	20 kV/cm

Q.154	The most commonly used insulating materials for low and medium voltage cables is
A	Polyethylene
B	Porcelain
C	PVC
D	Vulcanized rubber

Q.155	For insulators and bushings of power transformers, circuit breakers and instrument transformers, the suitable materials is
A	Epoxy resin
B	Polyesters resins
C	Porcelain
D	Silicon rubber

Q.156	Insulation of dry type transformers is done using prepregs. It is manufactured by using
A	Glass fibres
B	Nomex
C	Aramide papers
D	All of these

Q.157	Insulation is necessary for the protection of equipment. Insulation is not necessary between
A	Coils and earth
B	Coils of different phases
C	Turns in a coil
D	None of these

Unit 3: Overvoltage due to lightning phenomenon

Q.158	The volt ampere characteristic of a non-linear resistor used in surge arrester is given by
A	$V=KI^2$
B	$V=KI^n$
C	$V=KT^n$
D	$V=K_1 I+K_2I^{-1}$

Q.159	The equivalent circuit of a surge arrester may be represented as
A	capacitor
B	an inductor
C	non-linear resistor
D	resistor

Q.160	Basic impulse level (BIL) of a power system is defined as
A	the minimum Insulation Impulse withstand voltage of any power equipment or apparatus
B	the maximum power frequency withstand voltage of any power equipment or apparatus
C	the minimum power frequency withstand voltage of any apparatus or power equipment
D	the peak value of highest system voltages.

Q.161	The BIL of a power system is usually chosen as
A	25% to 30% more than the protective level offered by the protective devices (surge arresters etc.)
B	50% more than the protective level offered by the protective devices (surge arresters etc.)
C	5 to 10% more than the protective level offered by the protective devices (surge arresters etc.)
D	highest lightning surge voltage expected

Q.162	In EHV and UHV system the type of surge diverter used for overvoltage protection is
A	valve type Si C arrester
B	gapless ZnO arrester
C	gapless Si C arrester
D	rod gap

Q.163	The duration of switching surges in GIS is
A	ms
B	microseconds
C	few nanoseconds and less than a microsecond
D	few tens of micro seconds

Q.164	Indirect strokes near overhead transmission lines induce overvoltage due to
A	electrostatic induction
B	both electrostatic and electromagnetic induction
C	only electromagnetic induction
D	conduction currents through line conductors

Q.165	In EHV and UHV system, ratio of BIL to SIL will be usually
A	less than unity
B	more than 1.5
C	1.5 to 2.0
D	1.2 to 1.5

Q.166	The purpose of insulation coordination is to
A	limit the over voltages
B	to protect the electrical apparatus against over voltages
C	to grade the insulation of different power apparatus and overhead lines such that the least important and easily replaceable apparatus flashes or fails first and the most important one is protected to the highest level
D	None of the above a, b or c.

Q.167	The maximum rate of rise of surge currents that occur in overhead lines is
A	2 to 3 kA/ms
B	less than 1 kA/ms
C	5 to 10 kA/ms
D	greater than 10 kA/ms

Q.168	The attenuation constant of a transmission line in terms all the parameters R, L, G and C is
A	$\frac{R}{L}+\frac{G}{C}$
B	$\left[\frac{R}{L}+\frac{G}{C}\right]^{1/2}$
C	$\frac{1}{2}\left[\frac{R}{L}+\frac{G}{C}\right]$
D	$\frac{R}{L}-\frac{G}{C}$

Q.169	The reflection coefficient for a travelling voltage wave at a junction of two impedances Z1 and Z2 is
A	$\frac{(Z_1 + Z_2)}{(Z_1 - Z_2)}$
B	$\frac{(Z_1 - Z_2)}{(Z_1 + Z_2)}$
C	$\frac{(2Z_1)}{(Z_1 + Z_2)}$
D	$\frac{(2Z_2)}{(Z_1 + Z_2)}$

Q.170	A 400 Ω overhead line is connected to a cable having a surge impedance of 50 Ω, the transmission coefficient into the cable is
A	$2/9$
B	$1/4$
C	$-16/9$
D	$1/9$

Q.171	For surge-voltage computation, a transformer is represented by an equivalent circuit of
A	R-L parallel network
B	L-C parallel network
C	R-L series network
D	R-L-C series network

Q.172	Switching overvoltage in power system networks are of the order of
A	1.5pu
B	2.5to3.5pu
C	10pu or more
D	None of the above

Q.173	Overhead transmission lines are protected from lightning overvoltages by
A	counter poise wires
B	protector tubes
C	ground or shield wires above the main conductors
D	shunt reactors

Q.174	In order to limit the overvoltages developed on ground wires due to lightning strokes, the tower footing resistance should be less than
A	1000 Ω
B	100 Ω
C	25 Ω
D	1 Ω

Q.175	For a typical heavy duty (10 kA rated) surge arrester, the discharge voltage at rated current will be of the order of
A	1 pu
B	less than 2.0 pu
C	more than 3.5 pu
D	2.2 to 3.0 pu

Q.176	The material used in gap less surge arresters used in hv power system is
A	graphite
B	aluminium oxide
C	zinc oxide
D	silicon carbide

Q.177	Material that is used in surge arresters for EHV and UHV power systems
A	silicon carbide
B	zinc oxide
C	Aluminum oxide
D	metal oxides

Q.178	The electrical field developed within clouds before a lightning stroke occurs can be of the order of
A	0.1 kV/cm
B	1.0 kV/cm
C	100 kV/cm
D	10 kV/cm

Q.179	The maximum voltage gradient at the ground level due to a charged cloud before lightning strikes, can be as high as
A	1 V/cm
B	30 V/cm
C	30 V/m
D	300 V/cm

Q.180	The velocity of wind currents required for charge separation inside the moving clouds is of the order
A	1 to 5m/s
B	5 to 10m/s
C	10 to 20m/s
D	50 to 200m/s

Q.181	Velocity of leader strokes in lightning discharges is about
A	1.5x105cm/s
B	1.5x106cm/s
C	1.5 x 107 m/s
D	1.5 x 108 m/s

Q.182	The velocity of return or main stroke may be of the order of (C = velocity of light)
A	0.01 C
B	0.001 C
C	0.1 C
D	0.8 C

Q.183	The peak value of lightning stroke currents are of the order
A	100 A
B	1000 A
C	10 to 100 kA
D	106A

Q.184	The cumulative probability of a 10 kA lightning stroke current (peak) is about
A	0.6
B	0.2
C	0.1
D	0.98

Q.185	The rate of rise of current (dI/dt) in lightning strokes is
A	1 kA/ßs
B	100 kA/ßs
C	100 A/ms
D	1000 kA/ms

Q.186	The ground flashover density (Ng) in any region due to lightning activity is about (TD = thunderstorm days)
A	0.1 to 0.2TD/km2 -year
B	1 to 2TD/km2 -year
C	30 to 50TD/km2 -year
D	5 to 15TD/km2 -year

Q.187	Surge impedance of loss less transmission line is (if L - inductance/m, C - capacitance/m)
A	$\sqrt{C/L}$
B	$\sqrt{L/C}$
C	$1\sqrt{LC}$

D	$\sqrt{LC}$

Q.188	What happens when some serious phenomenon occurs in the insulators?
A	Puncher is produced in the insulator body
B	Insulator body bulges
C	Insulator body bursts
D	Insulator body tears apart

Q.189	What is the main cause for the failure of overhead line insulators?
A	Surges
B	Flashover
C	Arching
D	Grounding

Q.190	Corona results in
A	improvement in power factor
B	increased capacitive reactance of transmission lines
C	radio interference
D	better regulation

Q.191	Lighting arresters are used in power systems to protect electrical equipments against
A	Direct stroke of lightning
B	Power frequency of over voltages
C	Over voltages due to lightning stroke
D	Over current due to lightning stroke

Q.192	The lightning arrester acts as
A	Surge diverter
B	Surge coil
C	Surge absorber
D	Surge reflector

Q.193	Switching surges are originating from
A	Sudden switching off of loads
B	Short circuits and fault clearances
C	De-energizing of transmission lines, cables, shunt capacitor, capacitor banks, banks, etc.
D	All of the above

Q.194	Which of the following is the protective device against lightning over voltages?
A	Rod gaps
B	Surge absorbers
C	Horn gaps
D	All of the above

Q.195	A lightning arrester provides
A	A low impedance path between line and ground, during operation
B	A high impedance path between line and ground, during operation
C	A low resistance path between line and ground, during operation
D	A high resistance path between line and ground, during operation

Q.196	The lighting arrester is conducted
A	in series with the line
B	between line and earth
C	to a pole near the line
D	to circuit breaker

Q.197	Which harmonics are generated during the corona, which leads to the increase in corona losses?
A	Third harmonics.
B	Fifth harmonics
C	Seventh harmonics
D	None of these

Q.198	In which climate does the chances of occurrence of corona is maximum
A	Dry
B	Hot summer
C	Winter
D	Humid

Q.199	On which factor is the corona loss dependent on?
A	Material of the conductor
B	Diameter of the conductor
C	Height of the conductor
D	None of these

Q.200	Which of the following is the protective device against lightning over voltages?
A	Rod gaps
B	Surge absorbers
C	Horn gaps
D	All of the above