SUBJECT CODE :EE1005

SUBJECT NAME:POWER SYSTEM TRANSIENTS

UNIT-I SWITCHING TRANSIENTS

PART-A (1 MARK)

1. **Dielectric strength in case of mica can be expected to be more than**

   a. 500 kV/mm
   b. 1500 kV/mm
   c. 2500 kV/mm
   d. 3500 kV/mm

2. **All of the following dielectric materials are preferred for high frequency applications EXCEPT**

   a. Polyethylene
   b. Butyl rubber
   c. Teflon
   d. Polystyrene.

3. **Polar dielectrics are normally used for**

   a. high frequencies
   b. microwaves
   c. dc and power frequencies
   d. none of the above.

4. **Which of the following is a polar dielectric ?**

   a. Teflon
   b. Quartz
   c. Nylon
   d. Polyethylene

5. **Which of the following is a non-polar dielectric ?**

   a. Polystyrene
   b. Phenolic plastics
   c. Plasticized cellulose acetate
   d. Castor oil.

6. **The impurity in liquid dielectric which has significant effect in reducing the breakdown strength, is**

   a. dust
   b. dissolved gases
   c. moisture
   d. ionic impurities.

7. **The relationship between the breakdown voltage V and gap d is normally given as**

   a. $d = kV^2$
   b. $d=kV^3$
   c. $V = kd$
   d. $v = kd^n$.

8. **A good dielectric should have all the following properties EXCEPT**

a. high mechanical strength
b. high resistance to thermal deterioration
c. high dielectric loss
d. freedom from gaseous inclusion

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9. The variety of paper used for insulation purpose is

a. blotting paper
b. rice paper
c. craft paper
d. mill-board.

10. Which variety of mica is hard and brittle ?

a. Muscovite
b. Phlogopite
c. Fibiolite
d. Lipidolite.

11. Corona effect can be identified by

a. bushy sparks
b. faint violet glow
c. red light
d. arcing between conductors and earth.

12. The phenomenon of corona is generally accompanied by

a. a bang
b. a hissing sound
c. magnetic hum
d. all of the above.

13. Van de Graaff generators are useful for

a. Very high voltage and low current applications
b. Very high voltage and high current applications
c. Constant high voltage and current applications
d. High voltage pulses only.

14. In Van de Graaff generators output voltage is controlled by

a. controlling the corona source voltage
b. controlling the belt speed
c. controlling the lower spray point
d. any of the above.

15. A Tesla coil is a

a. cascaded transformer
b. coreless transformer
c. high frequency resonant transformer
d. low impedance transformer.

16. Switching surge is

a. high voltage dc
b. high voltage ac
c. short duration transient voltage
d. hyperbolically dying voltage.

17. Moles bridge is used to measure

a. properties of dielectric at dc
b. dispersion in insulation
c. high frequency high voltages
d. modulation ratio frequencies

18. Insulators for high voltage applications are tested for

a. power frequency tests
b. impulse tests
c. both (A) and (B) above
d. none of the above.

19. Impulse testing of transformers is done to determine the ability of

a. bushings to withstand vibrations
b. insulation to withstand transient voltages
c. windings to withstand voltage fluctuations
d. all of the above.

20. Transformers contribute to radio interference due to

a. corona discharges in air
b. internal or partial discharges in insulation
c. sparking
d. any of the above.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	b	c	c	a	c	d	c	c	c	b	b	a	a	c	c	b	c	b	d

PART-B (2MARKS)

21. **What is meant by resistance switching**?(**AU-APR08**)

A deliberate connection of a resistance in parallel with the contact space (arc) is made to overcome the effect of transient recovery voltage. This is known as resistance switching.

22. Define switching transients.

The switching transients is initiated whenever there is sudden change of circuit conditions. This transient is most frequently developed due to switching operations such as

The closing of a switch (or) circuit breaker to energies a load.

The opening of a circuit breaker to clear a fault.

23. Give the relation between time constant of parallel and series circuit.

Time constant of parallel circuit T_p=RC

Time constant of series circuit T_s=L/R

24. The product of there time constants is the square of the angular period of the undamped circuit which is given by

$T_pT_s=LC=T^2$

25. **What is the need of resistance switching.(AU-MAY10**)

The shunt resistors connected across circuit breaker have two functions.

To distribute the transient recovery voltage more uniformly across the several breaks.

To reduce the severity of transient recovery voltage at the time of interruption by introducing damping into oscillations.

26.**Define power system transients**.(**AU-MAY11**)

The power system transient is the outward manifestation of a sudden change in circuit conditions as when a switch opens are closes are fault occurs on a system the transient period is very short.

27.**Mention the sources of power system transient**.(**AU-MAY08**)

- Internal sources
  Switching surges, insulation failure, arching ground, ferro resonance.
- External sources.
  Lightning.

28.What are the causes of switching surges?(**AU-NOV09)**

The making and breaking of electric circuits with switch gear may result in abnormal transients over voltages in a power system having large inductance and capacitance.

29.**What is meant by arcing ground?(AU-MAY08)**

The phenomena of intermittent arc taking place in line to ground fault of a three phase system with consequent production of transients is known as arcing ground.It can be prevented by earthing the neutral.

30.**What is meant by lightning?**

An electric discharge between cloud and earth, between clouds or between charges centres of the same cloud is known as lightning.

31.What are the types of lightning?

- Direct stroke
- Indirect stroke.

32.**What are the types of power system transient?**

- Ultrafast transients
- Medium fast transients
- Slow transients.

33.**What are the effects of lightning?(AU-MAY11)**

Lightning produces a steep fronted voltage wave on the line. The voltage of this may rise from zero to peak value in about 1μs and decay to half the peak value in about 5μs.

34.**What is meant by insulation failure?**

The insulation failure between line to earth which cause high voltage in the system. Suppose a line at potential V is earthed at point C, the earthing of line causes to equal voltages-V travel along the main wire and return wire. Due to insulation failure, the current to earth is twice the ratio of voltage to impedance.

35.**What is meant by subsidence transients?**

When a disturbance such as fault occurs on the primary of transformer, then subsidence transient is produced. Due to this sudden reduction of voltage produced on the primary.

36.What are the causes of capacitor inrush currents?(AU-MAY/JUNE 2013)

The phenomena of intermittent arc taking place in line to ground fault of a three phase system with consequent production of transients is known as arcing ground.It can be prevented by earthing the neutral.

37. Define transient recovery voltage? AU-MAY/JUNE 2013)

The shunt resistors connected across circuit breaker have two functions.

To distribute the transient recovery voltage more uniformly across the several breaks.

To reduce the severity of transient recovery voltage at the time of interruption by introducing damping into oscillations.

PART-C (16MARKS)

38.What are the sources and effects of transients on power system? Explain in detail.(AU-MAY10)

39.Explain the various types of power system transients with illustration.(AU-NOV11)

40.Explain the significance of transient studies in power system planning. (AU-APR09)

41.Discuss in detail about the various types of power system transients? AU-MAY/JUNE 2013)

42.Draw the equivalent circuit for the resistance switching problems and explain the parameters for the expressions. AU-MAY/JUNE 2013)

43.Write a detailed technical note on the effect of transients on power system. AU-MAY/JUNE 2013)

44.Elaborate your comment on double frequency transients on power systems. AU-MAY/JUNE 2013)

UNIT-II LOAD SWITCHING

PART-A (1 MARK)

45.As compared to air the relative dielectric strength of sulphur hexafluoride is nearly

a. 1.5 times
b. 2.5 times
c. 4.0 times
d. 5.0 times

46.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.

47.Which of the following gas has been used as insulating medium in electrical appliances ?

a. Nitrogen
b. Carbon dioxide
c. Sulphur hexafluoride
d. Freon.

48.Vacuum insulation is used in all of the following EXCEPT

a. Particle accelerators
b. EHT of color TV
c. Field emission tubes
d. X-rays.

49.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.

50.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.

51.Surge voltage originate in power systems due to

a. lightning
b. switching operations
c. faults
d. any of the above.

52.All of the following are the preferred properties of a dielectric gas EXCEPT

a. high dielectric strength
b. physiological inertness
c. low atomic number
d. good heat transfer.

53.Corona results in

a. improvement in power factor
b. increased capacitive reactance of transmission lines
c. radio interference
d. better regulation

54.Which of the following technique/method is-used for the measurements of ac high frequency voltages ?

a. Peak voltmeter
b. Series resistance micro ammeter
c. Resistance potential divider
d. Any of the above.

55.Which of the following method or technique can be used for the measurement of high dc voltages ? 40

a. Generating voltmeter
b. Electrostatic voltmeter
c. Peak voltmeter
d. Any of the above.

56.All of the following methods/techniques can be used for the measurement of high ac voltages EXCEPT

a. Potential dividers
b. Potential transformers
c. Electrostatic voltmeters
d. Half effect generators.

57.Surge diverters are

a. non-linear resistors in series with spark gaps which act as fast switches
b. arc quenching devices
c. shunt reactors to limit the voltage rise due to Ferranti effect
d. over-voltages of power frequency harmonics.

58.Impulse voltages are characterized by

a. polarity
b. peak value
c. time of half the peak value
d. all of the above.

59.Paschen's law is associated with

a. breakdown voltage
b. ionization
c. thermal radiations
d. none of the above.

60.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

61.The breakdown voltage in gases depends on

a. distance between the electrodes
b. relative air density
c. humidity
d. all of the above.

62.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.

63.Large capacity generators are manufactured to generate power at

a. 440 V
b. 6.3 to 10.5 kV
c. 132 kV to 220 kV
d. 400 kV.

45	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
B	d	c	B	c	C	d	d	c	C	a	a	d	a	d	a	c	d	c	b

PART-B (2MARKS)

64.Define load switching.

The frequent functions performed by switching devices are to switch on and switch off load (ie) load switching which is represented by a parallel RL circuit.Low power factor loads are inductive and high power factor loads are resistive. When a high pf load is switched off, the effective capacitance of load becomes important in determining the form of transient produced.

65.What is meant by current chopping?(AU-APR09)

When breaking low currents (ie) unloaded transformer or reactor magnetizing current, the powerful deionizing effect of air blast circuit breaker (CB) causes the current abrupbtly to zero well before the natural current zero is reached.

66.Define capacitance switching.

The shunt capacitors are employed to correct a lagging power factor, or in some cases, to provide voltage support for the system. In some applications they are switched in and out quite frequently as the system load varies and the system fluctuates. The switching operations are nontrival and should be carefully considered when designing capacitor banks and their associated switching equipment.

67.Define ferro resonance condition.(AU-APR08)

Resonance causes high transient voltage in the power system. In usual transmission lines the capacitance is very small so that resonance rarely occurred in power system at normal frequency. However if generator emf wave is distorted, the trouble of resonance may occur due to 5^{th} (or) higher harmonics. This phenomenon is referred as ferro resonance, since the inductance involved is usually iron cored.

68.What is meant by abnormal switching transients?

Due to some other circumstances like transients the voltage and current magnitude may rise high. The transients occur due to the trapping of energy and its subsequent release somewhere in the circuit. Such transients are referred as abnormal current and voltage transients.

69.Define arcing ground (AU-NOV07)

If the neutral of three phase wires was not earthed in long enough voltage transmission

lines a serious problems called arching ground is produced. The arching ground produces severe oscillations of three to four times the normal voltage.The phenomenon of intermittent arc takes place in line to ground fault of a three phase system with consequent production of transients is known as arching ground.

70.What is meant by multiple restriking transients?(AU-MAY/JUNE 2013)

The shunt capacitors are employed to correct a lagging power factor, or in some cases, to provide voltage support for the system. In some applications they are switched in and out quite frequently as the system load varies and the system fluctuates. The switching operations are nontrival and should be carefully considered when designing capacitor banks and their associated switching equipment.

71.Briefly explain the ferroresonance phenomenon? (AU-MAY/JUNE 2013)

Resonance causes high transient voltage in the power system. In usual transmission lines the capacitance is very small so that resonance rarely occurred in power system at normal frequency. However if generator emf wave is distorted, the trouble of resonance may occur due to 5^{th} (or) higher harmonics.

PART-C (16MARKS)

59. Explain resistance switching with equivalent circuit.(AU-APR07)
60. Explain with appropriate waveform (a) current suppression (b) current chopping (c) ferro resonance condition.(AU-APR08)
61. Explain load switching with equivalent circuit.(AU-NOV10)
62. What is capacitance switching? Explain in brief the effect of source regulation and capacitance switching with a restrike.(AU-NOV09)
63. Write short notes on ferroresonance effect.(AU-APR11)
64. Explain the appropriate waeform, the capacitance switching with one and multiple restrikes.
65. Explain the switching in both normal and abnormal conditions with neat sketches.
66. Draw and explain the waveforms for transient voltage across the load switch. (AU-MAY/JUNE 2013)
67. Explain the characteristics of energy released by transformer when the magnetising current is chopped and derive the expression. (AU-MAY/JUNE 2013)
68. Discuss the capacitance switching with a restrike at peak voltage .Draw the characteristics and derive the expression. (AU-MAY/JUNE 2013)
69. What is meant by reignition current? Discuss the voltage escalation on interrupting current to inductive load? (AU-MAY/JUNE 2013)

UNIT-III LIGHTNING TRANSIENTS

PART-A (1 MARK)

70. Which soil has the least specific resistance ?

a. Land
b. Loamy soil
c. Clay
d. Peat

71. Which soil has the maximum specific resistance ?

a. Black cotton soil
b. Sand
c. Peat
d. Loamy soil.

72. In sphere gaps, the sphere are made of

a. aluminium
b. brass
c. bronze
d. any of the above.

73. In 'plasma' state a gas

a. loses electrical conductivity
b. conducts electricity
c. becomes perfect insulator
d. attracts moisture.

74. 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

75. Radiant efficiency of the luminous source depends on

a. shape of the source
b. temperature of the source
c. wavelength of light rays
d. all of the above.

76. Light waves travel with a velocity of

a. 3×10^{10}cm/s
b. 3×10^{12}cm/s
c. 3×10^{15} cm/s
d. 3×10^{18} cm/s.

77. Carbon arc lamps are commonly used in

a. domestic lighting
b. street lighting
c. cinema projectors
d. photography.

78. The unit of solid angle is

a. solid angle
b. radian
c. steradian
d. candela.

79. Candela is the unit of

a. Luminous flux
b. Luminous intensity
c. Wavelength
d. None of the above.

80. The unit of luminous flux is

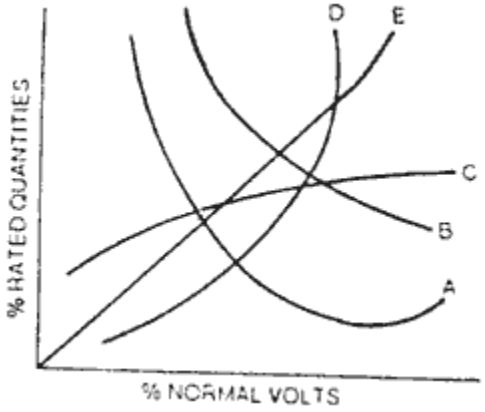
a. steradian
b. candela
c. lumen
d. lux.

81. The illumination is directly proportional to the cosine of the angle made by the normal to the illuminated surface with the direction of the incident flux. Above statement is associated with

a. Planck's law
b. Macbeth's law of illumination
c. Bunsen's law of illumination
d. Lambert's cosine law.

82. Which curve represents life of the lamp ?

44



a. curve A
b. curve B
c. curve C
d. curve D.

83. Illumination level required for precision work is around

a. 50 lm/m^2
b. 100 lm/m^2
c. 200 lm/m^2
d. 500 lm/m^2.

84. Which of the following will need the highest level of illumination ?

a. Proof reading
b. Bed rooms
c. Hospital wards
d. Railway platforms

85. Which of the following will need lowest level of illumination ?

a. Displays
b. Fine engraving
c. Railway platform
d. Auditoriums

86. Which of the following lamp gives nearly monochromatic light ?

a. Sodium vapor lamp
b. GLS lamp
c. Tube light
d. Mercury vapor lamp.

87. The illumination level in houses is in the range

a. 10-20 lumen/m^2
b. 30 - 50 lumen/m^2
c. 40-75 lumen/m^2
d. 100-140 lumen/m^2.

88. Luminous efficiency of a fluorescent tube is

a. 5- 10 lumens/watt
b. 15-20 lumens/watt
c. 30 - 40 lumens/watt
d. 60 - 65 lumens/watt.

89. One lumen per square meter is the same as

a. One lux
b. One candela
c. One foot candle
d. One lumen meter.

70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
d	b	D	b	c	b	a	c	C	b	c	d	b	d	a	c	a	d	d	A

PART-B (2MARKS)

90. What are the causes of over voltages in power systems?(AU-APR08)

Over voltages on power systems are do various cases. The voltage stresses due over voltages can be so high that may become dangerous to both the lines as well as connected equipment and may cause damage, unless some productive measures against these voltages are taken.

91. Define over voltage protection.

Transient over voltages arising on power system are assessed by an over voltage protection. This is defined as ratio of peak overvoltage to the rated peaks system frequency phase voltage.

92. **Define lightning.**(**AU-NOV07**)

Lightning phenomenon is a peak discharge in which charge accumulated in the clouds discharge into a neighboring cloud or to the ground.

93. **What are the different types of strokes?(AU-NOV10**)

- direct stroke.
- Indirect stroke.

94. **Explain direct lightning strokes**.

When the thundercloud directly discharged on to a transmission line tower or line wires is called direct stroke.This is the most severe form if the stroke. However for bulk of the transmission systems the direct strokes are rare.

95. What are the factors contributing to good transmission line design?(AU-APR08)

First we try to keep the incidence of stokes to the system to a minimum.

The objective of good design is to reduce the number of outages caused by lightning.

High surge impedance in griund wires, tower structures are to be avoided.

96. Explain the significance of tower footing resistance?(AU-APR09)

Tower footing resistance is the resistance offered by tower footing to the disipstion of current. The effective wire depends to a large extended on the tower footing resistance. The tower top potential depends on the resistance.

Significance:

A low value of tower footing resistance results in less voltage stresses across line insulation.A tower footing resistance of 20Ω for EHV lines and 10 Ω for HV lines provides sufficient lightning protection.

Depends on

Type of electrode configuration employed.

Soil resistivity

97. **What is the necessity of insulation co-ordination.(AU-APR09/ NOV08)**

Power system have components with different withstand voltages and volt time characteristics. Insulation co-ordination arms to correlating the insulation of these various components with the characteristics of protective devices so that the equipment is protected from over voltages.

98. What are the basic steps involved in insulation co-ordination.

Selection of standard insulation level.

Making sure that every equipment has a breakdown strength equal to higher than insulation level.

99. **What are the types of over voltages?(AU-DEC06)**

Lightning over voltages, switching over voltages.

100. Explain the various regions of the cloud.

The upper regions of the cloud are positively charged, whereas the lower region and the base are predominantly negative except the local region near the base and the head which is possible.

101. Mention the different theories of charge formation.(AU-APR11)

Simpson's theory, Reynold's theory and mason's theory**.**

102. What does a thunder cloud consist?

A thunder aloud consists of supercooled water droplets moving upwards and large

hailstones moving downwards.

103. **What is back flashover?(AU-NOV09)**

When a direct lightning stroke occurs on a tower, the tower has to carry huge impulse currents. If the tower footing resistance is considerable, the potential of the tower rises to a large value, steeply with respect to the line and consequently a flahover may take place along the insulator strings.

104. State the parameters and the characteristics of the lightning strokes.

Amplitude of the current, the rate of rise, the probability distribution of them and the waveshapes of the lightning voltages and currents.

105. Define isokeraunic level Or thunderstorm days.(**AU-APR09)**

It is the number as the number of days in a year when the thunderis heard recorded in a particular location. Often it does not distingulish between the ground strokes and the cloud-to-cloud strokes.

106. State the factors influence the lightning induced voltages on transmission lines.

The ground conductivity, the leader stroke current and the corona.

107. What is ground wire?(AU-APR07)

Ground wire is a conductor run parallel to the main conductor of the transmission line supported on the same tower and earthed at every equally and regularly spaced towers. It is run above the main conductor of the line.

108. What is the use of ground wire?

It shields the transmission line conductor from induced carges, from clouds as well as from a lightning discharge.

109. Define basic impulse level.(AU-NOV07)

It is defined as the minimum insulation impulse withstand voltage of any power equipment or apparatus. The BIL of a power system is usually chosen as 25% to 30%more than the protective level offered by the protective devices.

110. Mention the various insulation levels in a substation.

The busbar insulation is the higher to ensure the continuity of supply in a substation. The circuit breakers, isolator, instrument and relay transformers are given the next

lower limit level. The power transformers are the costliest and sensitive device and the insulation level for it is the lowest.

111. What does the selection of BIL level for lines depend?

Atmospheric conditions, lightning activity, insulation pollution and acceptable outage of the line.

112.Draw the lumped parameters equivalent circuits for lightning stroke to Tower. (AU-MAY/JUNE 2013)

It is defined as the minimum insulation impulse withstand voltage of any power equipment or apparatus. The BIL of a power system is usually chosen as 25% to 30%more than the protective level offered by the protective devices

113.Explain the charge formation in the clouds. (AU-MAY/JUNE 2013)

Ground wire is a conductor run parallel to the main conductor of the transmission line supported on the same tower and earthed at every equally and regularly spaced towers. It is run above the main conductor of the line.

PART-C (16MARKS)

114.Explain with neat sketches the mechanism of lightning discharge.(AU-NOV08)

115.Explain with neat diagrams the two different theories of charge generation and operator in a thunder cloud.(AU-APR07)

116.Explain the mechanism by which lightening strokes develop and induce over voltages on overhead power lines.

117.Give the mathematical model for lightning discharges and explain them.(AU-NOV09)

118.Explain the interaction between lightning and power system.

119.Explain lightening phenomenon.

120.Explain in detail how the charges are formed in the clouds.

121.Derive the mathematical model for lightning and also give its iteration with power systems.

122.What are the factors that contribute good line design. Explain the protection offered by ground wires. (AU-NOV11)

123.Explain about the tower footing resistance.

124.Explain the importance of switching over voltage in EHV power systems? How is protection against over voltage achieved? (AU-NOV07)

125.Explain with suitable figure the principles and functioning of a) expulsion gaps, (b) protector tubes.

126.Discuss the phenomenon of lightning? (AU-MAY/JUNE 2013)

127.Explain the mechanism of Lightning? (AU-MAY/JUNE 2013)

128.Derive the mathematical model of Lightning?Express the various parameters in lightning strokes? (AU-MAY/JUNE 2013)

UNIT – IV TRAVELLINING WAVES ON TRANSMISSION LINE AND TRANSIENTS.

PART-A (1 MARK)

129.Standard wattage of 3 ft. fluorescent tube is

a. 10 W
b. 40 W
c. 65 W
d. 100 W.

130.For the same wastage which lamp is cheapest ?

a. Sodium vapor lamp
b. Mercury vapor lamp
c. Fluorescent tube
d. GLS lamps

131.Optical instruments used for the comparison of candle powers of different sources arc known as

a. Candle meters
b. Radio meters
c. Bunsen meter
d. Photo meter

132.Which photometer is used for comparing the lights of different colors ?

a. Bunson photometer
b. Grease spot photometer
c. Lummer Brodhum photometer
d. Guilds Flicker Photometer.

133.Which photometer depends for its operation on Lambert's cosine law ?

a. Macbeth lllumino meter
b. Trotter Illumination Photometer
c. Lummer Brodhum Photometer
d. Guild's Flicker Photometer

134.Which photometer depends for its operation on Inverse Square Law ?

a. Guilds Flicker Photometer

b. Lummer Brodhum Photometer
c. Macbeth llluminometer
d. Trotter Illumination Photometer.

135.The color temperature of day light is around

a. 50 K
b. 160 K
c. 600 K
d. 6000 K.

136.Light is produced in electric discharge lamps by

a. heating effect of current
b. magnetic effect of current
c. ionization in a gas or vapor
d. carbon electrodes.

137.A auto transformer used with sodium vapor lamp should have

a. high efficiency
b. high step-up ratio
c. high step-down ratio
d. high leakage reactance.

138.The capacitor used in auto transformer circuit for sodium vapor lamps, is for

a. protection against accidental power failure
b. controlling illumination level of the lamp
c. for regulating discharge voltage
d. for improving the power factor of the circuit.

139.Which gas is sometimes used in filament lamps ?

a. Argon
b. Krypton
c. Nitrogen
d. Carbon dioxide.

140.Which bulb operates on lowest power ?

a. Night bulb
b. Neon bulb
c. GLS bulb
d. Torch bulb.

141.The output of a tungsten filament lamp depends on

a. size of lamp
b. size of shell
c. temperature of filament
d. all of the above.

142.A zero watt lamp consumes

a. no power
b. about 5 to 7 W power
c. about 15 to W power
d. about 25 to 30 W power.

143.Melting temperature of tungsten is

a. 2000°K
b. 2500°K
c. 2655°K
d. 3655°K.

144.The life of incandescent lamp is expected to be

a. 100 hours
b. 200 hours
c. 1000 hours
d. 10000 hours.

145.The source of illumination for a cinema projector is

a. Incandescent lamp
b. Mercury vapor lamp
c. Sodium lamp
d. Carbon arc lamp.

146.Sodium vapor lamps need ionization potential of about

a. 5 volts
b. 50 volts
c. 100 volts
d. 112 volts.

147.When a sodium vapor lamp is switched on, initially the color is

a. Pink
b. Yellow
c. Green
d. Blue

148.In a sodium vapor lamp the discharge is first started in the

a. neon gas
b. nitrogen gas
c. argon gas
d. krypton gas.

127	128	129	130	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148
B	d	d	d	b	c	d	c	a	A	d	b	a	d	c	b	d	c	d	a

PART-B (2MARKS)

149.What do you mean by travelling waves?(AU-APR09)

Any disturbance on a transmission line or system such as sudden opening or closing of line, a s.c or a fault results in the development of overvoltage or overcurrent at that point. This disturbance propogates as a travelling waves to the ends of the line or to a termination such as a substation usually these travelling waves are high frequency disturbances and travelling as waves. They may be reflected, transmitted, attenuated during propagation until the energy is absosrbed.

150.What are the damages caused by the travelling waves?

The high peak (or) crest voltage of the surge may cause flashover in the internal winding their by spoil the windings insulation.The steep wave front of the surge may cause internal flashover between inter turns of the transformer.

151.What is surge impedance of a line and why is it also called the natural impedance? (AU-APR11)

The ratio of voltage to current which has the dimension of impedance is called as surge impedance of the line.

1. $E/I=\sqrt{(L/C)} = Z_c = Z_n$ (natural impedance)

It is also called the natural impedance because this impedance does not depend on load impedance but depends only on the line constants. The value of this impedance is 400Ω to 600Ω for an overhead line and 40 to 60Ω for a cable.

152.What is the application bewley's lattice diagram?

With the use of bewley's diagram one can know at a glance the position the direction of motion of every incidence of reflected and transmitted wave on the system at every instant of time

153.What are the specifications of of a travelling waves?

A travelling waves is characterized by the four specifications

- Crest of a wave.
- Front of a wave
- Tail of a wave.
- Polarity.

154.Define crest and front of a travelling wave. (AU-APR08)

Crest: The crest of the wave is the maximum amplitude of the wave and is usually expressed in KV or KA.

Front: the front of the wave is the proportion of the wave before crest and is expressed in time from beginning of the wave to the crest value in ms or μs.

155.Define tail and polarity of a wave. (AU-APR07)

Tail : tail of a wave is the portion beyond the crest. It is expressed in time (μs) from beginning of the wave to the point where the wave has reduced to 50% of its value at crest.

Polarity: it is polarity of crest voltage or current . a positive wave of 500Kv crest,

I μs front time and 25 μs tail time will be represented as +500/ 1.0/ 25.0

156.Why step waves are considered to be dangerous to the apparatus?

The simplest and most commonly used representation is the infinite rectangular or step wave.Such as wave jumps suddenly from zero to full value and is maintained at that value there after.**As** this wave has front causing maximum gradients ans sustained tail producing maximum oscillations in machine windings it is most dangerous to apparatus/ equipment. Hence the analysis based on it is liable to error on the safer side.

157.Write the expression for reflection coefficient and refraction coefficient.

Reflection coefficient: $a=(Z_b - Z_a) / (Z_b + Z_a)$ $-1<a<+1$.

Refraction coefficient $a = 2Z_b / (Z_b + Z_a)$

Where (Z_b , Z_a) are the characteristic impedance of the line.

158.What is the effect of shunt capacitance at the terminal of a transmission lines?

The effect of shunt capacitance at the terminal of a transmission line is to cause the voltage at the terminal is to rise to full value gradually instead of abruptly. i.e, to cause flattening of the wave front which reduces the stress on the line end windings of transformer connected to the lines.

159.Why velocity of propogation over all overhead lines is same? (AU-NOV08)

velocity of propogation over all overhead lines is same because the product of l& c is same for all overhead lines.velocity of propogation $v = 1/\sqrt{LC}$

160.What is attenuation? How they are caused?

The decrease in the magnitude of the wave as a propogates along the line is called attenuation. It is caused due to the energy loss in the line,

161.What is distortion?

The elongation or change of wave shape that occurs is called distortion.

162.What are the design principles observed in lattice diagram?

All waves travel down hill(i.e) in to the positive time.The position of the wave at any instant is given by the means of the time scale at the left of the lattice diagram.

163.How are the transmission lines classified? (AU-NOV10)

These are classified as

- lines with no loss or ideal loss
- lines without distortion or distortion less lines.
- Lines with small loss
- Lines with infinite and finite length defined by all the four parameters.

164.What are standing waves?

A standing wave, also known as stationery waves, is a wave that remains constant position. This phenomenon can occur because the medium is moving in the opposite direction to the wave, or it can arise in a stationery medium as a result of interference between two waves travelling in opposite direction.

165.Define SWR.

Standing wave ratio: is the ratio of the amplitude of a partial standing waves at an antinode to the amplitude at an adjacent node is an electrical transmission line.

166.Define standing wave voltage ratio. (AU-MAY/JUNE 2013)

Standing wave ratio: is the ratio of the amplitude of a partial standing waves at an antinode to the amplitude at an adjacent node is an electrical transmission line.

167. Distinguish between reflection and refraction of travelling waves. (AU-MAY/JUNE 2013)

Reflection coefficient: $a=(Z_b - Z_a) / (Z_b + Z_a)$ $-1<a<+1$.

Refraction coefficient $a = 2Z_b / (Z_b + Z_a)$

Where (Z_b , Z_a) are the characteristic impedance of the line.

PART-C (16MARKS)

168.Drive the expressions for the voltage and current waves on long transmission line.

169.Explain the transient response of a system with series and shunt distributed lines.

170.Explain the transient response of a system with series and shunt and lumped parameters.(AU-NOV10)

171.Explain the travelling wave concept with step response.(AU-APR07)

172.Describe the detail in terms:

Attenuation , distortion of travelling waves. (AU-NOV08)

173.Derive the expression for reflection coefficient and refraction coefficient and explain the behavior of travelling waves at short circuited lines.

174.Explain the behavior of travelling waves at open circuited lines.

175.Explain the behavior of travelling waves at reactive termination. (capacitance and inductance termination)(AU-NOV09)

176.Explain the bewley's lattice diagram with an example.

177.Derive an expression for standing wave equation.(AU-APR08)

178.Derive the wave equation and express the various parameters. (AU-MAY/JUNE 2013)

179.Explain the behavior of travelling waves at line terminals. (AU-MAY/JUNE 2013)

180.Draw and explain Lattice diagram. (AU-MAY/JUNE 2013)

UNIT -V TRANSIENTS IN INTEGRATED POWER SYSTEM

PART-A (1 MARK)

181.A mercury vapor lamp gives

a. pink light
b. yellow light
c. greenish blue light
d. white light.

182.Under the influence of fluorescent lamps sometimes the wheels of rotating machinery appear to be stationary. This is due to the

a. fluctuations
b. luminescence effect
c. stroboscopic effect
d. low power factor.

183.Power factor is highest in case of

a. Mercury arc lamp
b. Sodium vapor lamps
c. Tube lights
d. GLS lamps.

184.Which of the following electric discharge lamp gives highest lumens/watt

a. Sodium vapor lamp
b. Neon lamp
c. Mercury lamp at low pressure

d. Mercury vapor at high pressure
e. .

185.The solid angle subtended at the center of a hemisphere of diameter D will be

a. $4\pi D$
b. $2\pi D$
c. 2π
d. 4π

186.Which one of the following is a cold cathode lamp ?

a. Sodium lamp
b. Neon lamp
c. GSL lamp
d. Tube light.

187.In a mercury vapor lamp light red objects appear black due to

a. high wavelength of red objects
b. color mixing
c. absence of red light from lamp radiation
d. absorption of red light by the lamp radiation.

188.The flicker effect of fluorescent lamp is more pronounced at

a. lower voltages
b. higher voltages
c. lower frequencies
d. higher frequencies

189.The frequency of flickers in a fluorescent lamp at 220 V, 50 Hz supply will be

a. 25 per second
b. 50 per second
c. 100 per second
d. 220 per second

190..**Wavelength of green color is nearly**

a. 4000 A
b. 4500 A
c. 5000 A
d. 5500 A.

191.One Angstrom is

a. 10^{-6} meter
b. 10^{-8} meter
c. 10^{-8} cm
d. 10^{-8} mm.

192.Which of the following color has wave-length between green and color ?

a. Yellow
b. Blue
c. Violet
d. None.

193.The purpose of providing a choke in a tube light is

a. to eliminate corona effects
b. to avoid radio interference
c. to improve power factor

d. to limit current to appropriate value

194.A 60 W lamp given a luminous flux of 1500 lumen. Its efficiency is

a. 1500 lumen/watt
b. 250 lumen/watt
c. 25 lumen/watt
d. 2.5 lumen/watt

195.One lux is the same as

a. one lumen/sq. cm
b. one lumen/sq. m
c. one lumen/100 sq. m
d. one lumen/1

196.The vacuum inside an incandescent lamp is of the order of

a. 10^{-2} mm Hg
b. 10^{-3} mm Hg
c. 10^{-4} mm Hg
d. 10^{-5} mm Hg.

197.Which of the following application does not need ultra-violet lamps ?

a. Medical purposes
b. Aircraft cockpit dashboard lighting
c. Car lighting
d. Blue print machines.

198.When using ultra-violet lamps the reflector for maximum should be made of

a. aluminium
b. copper
c. leaf
d. glass.

199.Which of the following combination of gas is filled in lamp and the resulting color is incorrect?

a. Neon-red
b. Nitrogen-buff
c. Carbon dioxide - day light white
d. Magnesium-white.

200.Which of the, following vapors/gas will give yellow color in a filament lamp ?

a. Helium
b. Mercury
c. Sodium
d. Magnesium

181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
c	c	D	a	c	b	c	c	c	d	c	d	c	a	d	C	b	c	c	A

PART-B (2MARKS)

201.What is meant by kilometric fault?(AU-NOV08)

Kilometric fault is the fault located beyond the terminals and thus the current can be easily interrupted due to the added impedance of the line. This added impedance not only limits the current but also supports some of the system voltage.

202.What are the causes of over voltage?(AU-DEC09)

i)the over voltage are induced when a ground fault occurs on one of the conductors.

ii)A line to ground fault can produce an overvoltage on an un faulted phase as high as 2.1 times the normal line to neutral voltage on a three phase line.

203.What is meant by switching surges?(AU-NOV06)

The disturbance produced by the switching operation in a system which sets up travelling waves which travel along the connected lines to and fro. These disturbances are called as switching surges.

204.Define reflection coefficient.(AU-APR10)

The reflection coefficient (a) is given by the ratio of the voltage of reflected wave to the voltage of incident wave of a transmission line due to the travelling waves caused by switching surges.

i. Reflection coefficient $a = V_r / V_i$

Where V_r = is the reflected wave. V_i= is the incident wave.

205.Define transmission coefficient.

It is defined as the ratio of voltage of transmitted wave to the voltage of incident wave.Transmission coefficient = V_t / V_i

206.What is meant by EMTP?(AU-APR10)

The EMTP is a comprehensive computer program designed to solve electrical transient problems in lumpy circuits, distributed circuits. This program is capable of solving steady-state circuit problems. Transients analysis can be carried out in circuits without any arbitrary configuration of lumped parameters (R, L, & C).

Transmission lines with distributed parameters, transposed (or) untransposed, can be included in the network.

207.What are the effects of load rejection in power systems?(AU-APR06)

Sudden load rejection on large power systems causes the speeding up of generator prime movers. The speed governors and automatic voltage regulates will intervene to restore the normal conditions. Initially both the frequency and voltage increases.

208.Write the network equation to model a transmission network for EMTP calculation.

i. [G][V(T)] = [I(T)-[I]]

Where [G] is the nodal conductance matrix.

[V(T)] is the node voltages.

[I(T)] is the vector of current sources

[I] is the vector of past history terms.

209.What are the effects of transients when a switch a switch is closed?

When a switch is suddenly closed immediately prior to the circuit being completed, a certain voltage across the switch contacts. At the moment the contacts made by pre striking discharge, this voltage appears.

210.Draw the lattice diagram for single transmission line terminated in an impeadance? (AU-MAY/JUNE 2013)

i)the over voltage are induced when a ground fault occurs on one of the conductors.

ii)A line to ground fault can produce an overvoltage on an un faulted phase as high as 2.1 times the normal line to neutral voltage on a three phase line.

211. What is meant by EMTP? (AU-MAY/JUNE 2013)

The EMTP is a comprehensive computer program designed to solve electrical transient problems in lumpy circuits, distributed circuits. This program is capable of solving steady-state circuit problems. Transients analysis can be carried out in circuits without any arbitrary configuration of lumped parameters (R, L, & C).

PART-C (16MARKS)

212.Explain the occurrence and effects of kilometric fault in a power system.(AU-APR10)

213.Explain in detail about the switching surges on an integrated power system.

214.Derive the reflection and transmission co-efficient in an integrated power system.

215.Explain the network modeling for EMTP calculation.(AU-APR10/ NOV08)

216.Explain the modeling of lumped parameters R, L & C for EMTP calculation.(AU-NOV09)

217.Explain the computational procedure for EMTP calculation with a Neat flow chart.

218.Derive the expression for response and recovery voltage of a shorted line.(AU-APR06)

219.Explain the causes of transient on closing and reclosing of transmission line.

220.Explain and analyze the causes of over voltages induced by various faults occurring in power system.(AU-NOV07)

221.Define the term:(AU-MAY/JUNE 2013)

- **transmission coefficient.**
- **kilometric fault**
- **switching surges**
- **effects of load rejection**

222.Explain the voltage transients on closing and reclosing lines with expressions. (AU-MAY/JUNE 2013)

223.Discuss the following (AU-MAY/JUNE 2013)

- **Overvoltage induced by faults**
- **Line dropping and load rejection.**