SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : EPTS(**13A02502**) **Course & Branch**: B.Tech - EEE

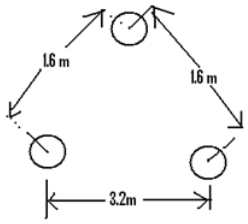
Year & Sem: III-B.Tech & I-Sem **Regulation:** R13

UNIT –I

TRANSMISSION LINE PARAMETERS

1. (a) Find the expression for inductance of a two-wire single phase transmission line 5M

   (b) Determine the inductance of a three phase line operating at 50Hz and conductors are arranged as follows. The conductor diameter is 1cm. 5M



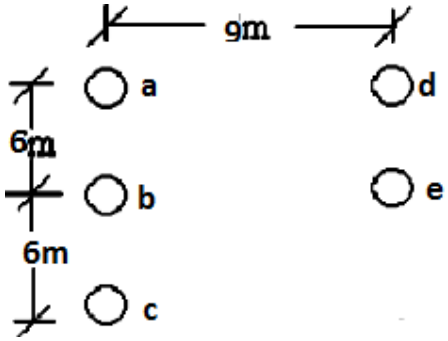
fig

2. (a) Derive the expression for the capacitance of a three phase double circuit hexagonal spacing configuration. 5M

   (b) Determine the inductance/phase/km of a double circuit 3-phase line. The radius of each conductor is 20mm and the conductors are placed on the circumference of an imaginary circle at a distance of 7m forming a regular hexagonal figure. 5M

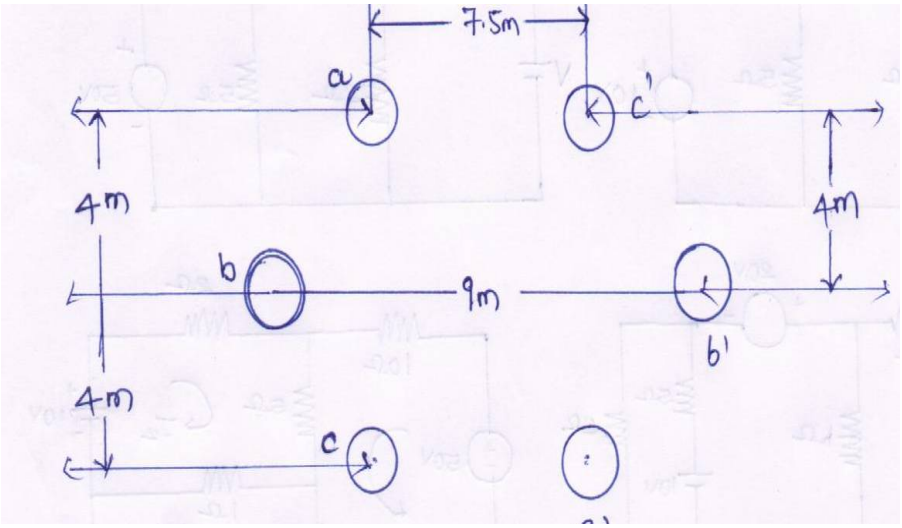
3. (a) Derive the expression for the inductance of a three phase double circuit flat vertical spacing configuration. 4M

   (b) Determine the inductance of a single phase transmission line consisting of three conductors of 2.5mm radii in the GO conductors and two conductors of 5mm radii in the RETURN conductors. The configuration of the line is as shown in figure bellow. 6M



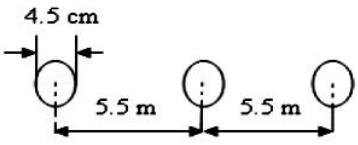
4. Deduce an expression for line neutral capacitance for a three phase overhead transmission line when the conductors are (i) symmetrically placed (ii) Asymmetrically placed but transposed. 10M

5. Determine the capacitance and the charging current per km of a transposed double circuit three-phase line operates at 220kv, dia of conductor is 2.5cm as shown in figure. 10M



6. (a) Derive the expression for flux linkages of one conductor in a group of n-conductors 5M

(b) Determine the inductance per km per phase of a single circuit 20kVline of given configuration as shown in fig. The conductors are transposed and have a diameter of 4.5cm.

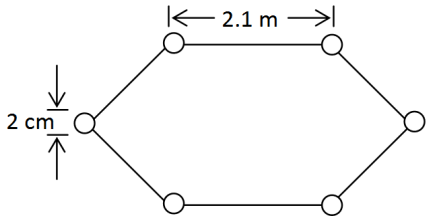


7. (a) Derive the expression for the capacitance of a single phase two wire line. 5M

(b) A single phase transmission line has two parallel conductors 3m apart, radius of each conductor being1cm. Calculate the capacitance of the line per km. 5M

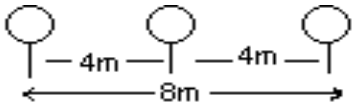
8. (a) Show that the capacitance per phase per meter of a double circuit regular hexagonal spacing transmission line is $c = \frac{4\pi\varepsilon_0}{\ln \frac{\sqrt{3}\,D}{2r}}$ F/meter/conductor, where D is conductor spacing and r is the radius of the conductor. 5M

(b) Calculate the capacitance (phase to neutral) of a 3-ϕ 100km long double cut line shown in figure with conductors of diameter 2.0 cm each, arranged at the corners of an hexogen with sides measuring 2.1m. 5M



9. (a) Derive an expression for the inductance per phase for a 3-phase overhead transmission line when conductors are symmetrically placed. 5M

(b) Calculate the inductance per phase of a three –phase transmission line as shown in following fig. The radius of the conductor is 0.5cm. The lines are un-transposed. 5M



. 10. a) What is skin effect? And proximity effect? 2M

b) What is the bundling of the conductor? 2M

c) What is transposition of conductors? And why transposition of line conductors are needed? 2M

d) Write few points about stranded conductors 2M

e) On what factors does Skin effect depend. 2M

UNIT –II

PERFORMANCE OF TRANSMISSION LINES

1. Derive the ABCD constants of medium transmission line by using nominal-T and nominal Π methods. 10M
2. A 100km long,3-phase,50Hz transmission line has following line constants: Resistance/ph/km=0.1ohm,Reactance/ph/km=0.5ohm, Susceptance/ph/km=$10*10^{-6}$siemen.If the line supplies load of 20MW at 0.9 p.f lagging at 66KV at the receiving end, calculate(i) Sending end power factor (ii) % regulation (iii)Transmission efficiency. By using nominal Π method 10M
3. An overhead 3-phase transmission line delivers 400KW at 11KV at 0.8 pf lagging. The resistance and reactance of earth conductors are 1.5Ω and 4Ω per phase respectively. Determine (i) The sending end voltage.(ii) percentage regulation.(iii) Transmission efficiency. 10M
4. Evaluate the generalized circuit constants for (i) short transmission line (ii) medium line nominal T method (iii) medium line nominal Π method. 10M
5. Using nominal Π method, find the sending end voltage and voltage regulation of a 250km, three phase 50Hz,transmission line delivering 25MVA at 0.8 lagging pf to a balanced load at 132kV. The line conductors are spaced equilaterally 3m apart. The conductor resistance is 0.11Ω/km and its effective diameter is 1.6cm. Draw the relevant circuit and phasor diagrams. 10M
6. Starting from the fundamentals determine the equivalent- T network and equivalent- Π network parameters of a long transmission line. 10M
7. Using rigorous method, derive expressions for sending end voltage and current for a long transmission line. 10M
8. A 3-phse 200km long high voltage line has Z=(14.4+j51.48) Ω and Y=(0+j1.194*10^{-6}) Siemens. Find the characteristic impedance , propagation constant and constants A,B,C and D for the line. 10M
9. (a) Prove the relation AD-BC=1 by considering a two terminal pair network for nominal T-method 5M

   (b) What is a surge impedance loading? 5M
10. a) Define the voltage regulation in transmission line. 2M

    b) Define transmission efficiency. 2M

    c) How the transmission lines are classified? 2M

    d) Determine the ABCD constants for short transmission line. 2M

e) Draw the phasor diagram for nominal Π method. 2M

UNIT –III

MECHANICAL DESIGN OF TRANSMISSION LINES

1. (a). Explain various types of insulators with neat diagrams and compare them? 5M

   (b). A three phase overhead line is suspended by a suspension type insulator, which Consists of three units. The potential across top unit and middle unit are 12 kv and 18 kv Respectively. Calculate: (i) the ratio of capacitance between pin and earth to the self Capacitance of each unit (ii).The line voltage and (iii) String efficiency. 5M

2. (a) What are the factors affecting corona? And derive the expressions for critical disruptive and visual critical voltage 4M

   (b) Determine the corona characteristics of a 3-phase line 160km long, conductor diameter 1.036cm, 2.44m delta spacing, air temperature 26.67oC, altitude 2440m, corresponding to an approximate barometric pressure of 73.15cm of Mercury, operating voltage 110kv at 50Hz. Assume data if required.(irregularity factor etc.) 6M

3. (a) Derive the expression for sag and tension when the supports are at unequal heights 5M

   (b) An overhead transmission line at a river crossing is supported from two towers at heights of 40m and 90 m above water level. The horizontal distance between the towers being 400m.If the allowable tension is 2000kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1kg/m 5M

4. (a) A string of six insulator units has a self capacitance is equals to 10 times the pin to earth capacitance. Find (i) voltage distribution across various units as a percentage of total voltage across the string. (ii) the string efficiency. 5M

   (b) A certain 3-phase equilaterally spaced transmission line has a total corona loss of 55KW at 110 KV and a loss of 110KW at 120 KV. What is the disruptive critical voltage between lines? What is the corona loss at 125KV? 5M

5. (a) Each line of a three phase system is suspended by a string of three identical insulators of self capacitance of C farad. The shunt capacitance of connecting metal work of each insulator is 0.2C to earth and 0.1C to line. Calculate the string efficiency of the system and also calculate string efficiency if a guard –ring increases the capacitance to the line of metal work of the lowest insulator to 0.3C 5M

(b) What do you understand by grading of insulators? Explain. 5M

6. (a) Write a short note on (i) effect of Wind and ice loading on calculation of sag and (ii) sag-template 5M

(b) An overhead line erected across a span of 250 meters on level supports. The conductor has a diameter 1.4cm and has a dead weight of 1.9kg/m. The line is subjected to wind pressure of 37.8 kg/m^2 of projected area. The radial thickness of ice is 1.3cm.calculate (i) the sag in an inclined direction (ii) the sag in vertical direction. Assume maximum working stress 1050kg per sq. cm. One cubic meter of ice weight 913.5kg. 5M

7. (a) Explain about the improvement of string efficiency by grading of units and guard ring 5M

(b) An overhead line has a span of 150 m between level supports. The conductor has a cross sectional are of 2cm^2. The ultimate strength is 5000kg/cm^2 and safety factor is 5. The specific gravity of the material is 8.9gm/cm^3. The wind pressure is 1.5kg/m. calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7 m is to be left between the ground and the conductor. 5M

8. (a) Derive the expression for sag for equal supports 4M

(b) Each conductor of a three phase over head line is suspended from a cross arm of a steel tower by a string of 4 suspension insulators. The voltage across the second unit is 14.2kv and across the third 20kv. Find the voltage between the conductors and the string efficiency. 6M

9. (a) Explain the concept and phenomenon of corona. 5M

(b) Write short notes on String chart. 5M

10. a) Define string efficiency . 2M

b) What is puncture and flash over in an insulators? 2M

c) Define critical disruptive voltage and visual critical voltage also write the formulae 2M

d) Define sag. Write the formula for sag. And draw the unequal supports structure. 2M

e) What is local corona? 2M

UNIT –IV

POWER SYSTEM TRANSIENTS & TRAVELLING WAVES

1. Derive the expression for transient current wave, show that transient current is sum of incident current, and reflected current. 10M
2. (a) How can the analysis of a wave travelling on a line terminated by an inductance be carried out?
   (b) Write short notes on Beweley's lattice diagram 5M
3. A surge of a 200kv travelling on a line of natural impedance 500ohms arrives at a junction with two lines of impedances 700ohms and 300ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current. 10M
4. What is meant by power system transients? Develop the differential equation for a transient in the transmission system. How voltage and current expressions are established from the above differential equations? 10M
5. Discuss the phenomenon of reflection and refraction in travelling waves. Derive the expressions for reflection and refraction coefficients when a travelling wave is terminated through a resistance. 10M
6. A surge of 15KV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are respectively 0.3mH, 0.4µF and 1.5 mH,0.012µF per Km. find the voltage rise at the junction due to the surge. And derive the formula used. 10M
7. Discuss the phenomenon of reflection and refraction in travelling waves. Derive the expressions for reflection and refraction coefficients when a travelling wave is terminated through an Open circuited line, short circuited line and reactance. 10M
8. A cable with a surge impedance of 100 ohms is terminated in two parallel- connected, open-wire lines having surge impedance of 600 and 1000 ohms respectively. If a steep fronted voltage wave of 1000V travels along the cable, find from the first principles the voltage and current in the cable and the open-wire lines immediately after the travelling wave has reached the transition point. The line may be assumed to be of infinite length. 10M
9. A surge of 220kV travelling in a line of natural impedance 500Ω arrives at a junction with two lines of impedances 700Ω and 400Ω respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current. 10M
10. a) Explain about propagation of surges . 2M

b) Explain reflection and refraction coefficients 2M

c) Define surge impedance loading. 2M

d) Define surge impedance. 2M

e) Define refraction co efficient for current 2M

UNIT –V

CABLES

1. Derive the following (i) Insulation resistance of a cable (ii) Capacitance of a single core cable . 10M
2. Write short notes on: (a) Intersheath grading (b) capacitance grading 10M
3. (a) What are the limitations of belted cable? How these are can be overcome in pressurized cables?

   (b) A33KV single core cable has a conductor diameter of 10mm and sheath of inside diameter of 40mm. find the maximum and minimum stress in the insulation.
4. (a) Distinguish between Underground cables and overhead lines.

   (b) Explain the pressure cables with a neat sketch.
5. (a).Show that in a three core belted cable the neutral capacitance to earth conductor C_n is equal to C_s+3C_c where C_s and C_c are capacitances of each conductor to sheath and to each other respectively.

   (b) Show that the ratio of maximum potential gradient to the minimum potential gradient is R/r. Where r and R are the conductor radius and sheath radius.
6. (a) Distinguish between the advantages & disadvantages of underground cable over overhead lines.

   (b) The maximum and minimum stresses in the dielectric of a single core cable are 40kv/cm (r.m.s) and 10kv/cm (r.m.s) respectively. If the conductor diameter is 1cm, find: (i) Thickness of insulation & (ii) Operating voltage.
7. (a) What is the necessity of grading of cables? Explain briefly the various grading methods of cables**?**

   (b) Explain the classification of cables.

8. (a) Derive a relation between the conductor radius and inside sheath radius of a single core cable so that the electric stress of the conductor surface may be minimum.

   (b) A cable has been insulated with two insulating materials having permittivity of 6 and 4 respectively. The inner and outer diameter of a cable is 3cms and 7cms. If the dielectric stress is 50kV/cm and 30kV/cm, calculate the radial thickness of each insulating layer and the safe working voltage of the cable.

9. Explain the construction of underground cables.

10. a) What is a cable? What types of insulating materials are used in cables?

    b) what is a dielectric test?

    c) Draw 3-core cable and indicate its parts.

    d) Classify the cables based on voltage and type of insulating materials used in them.

    e) Write a short note on screened cable

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QUESTION BANK (OBJECTIVE)

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UNIT – I

TRANSMISSION LINE PARAMETERS

1. AAC stands for [ ]
   A) All aluminum conductors B) Alloy aluminum conductors
   C) Aluminum alloy conductors D) All alloy conductors

2. The number of strands in a stranded conductor can be determined by N= [ ]
   A)3n(n-1) B) 3n(n+1)+1
   C) 2(n+1) D) 3n(n+1)

3.The crowding of alternating current on the surface of a conductor known as [ ]
   A) Ferrante effect B) Proximity effect
   C) Skin effect D) Spirality effect

4. By which of the following systems electric power may transmitted? [ ]
   A) Overhead system B) Underground system
   C) Both (A)&(B) D) None of the above

5. Which of the following materialis not used for transmission and distribution of power [ ]
   A) Copper B) Aluminium
   C) Steel D) Tungsten

6. The usual spans R.C.C poles are [ ]
   A) 40-50m B) 60-100m
   C) 80-100m D) 300-500m

7. If the length of the transmission line increases its inductance [ ]
   A) Decreases B) Increases
   C) Constant D) Neglected

8. If the length of the line is decreased, its capacitance is…….. [ ]
   A) Decreases B) Increases
   C) Constant D) Neglected

9. Which of the following are the constants of the transmission lines ? [ ]

A) Resistance B) Inductance

C) Capacitance D) All of the above

10. The self GMD method is used to evaluate [ ]

A) Inductance B) Capacitance

C) A &B D) None

11. The voltage of the single phase supply to residential consumer is [ ]

A) 110V B)210V

C) 230V D) 420V

12.Inductance of 1-Φ two wire is [ ]

A) 0.2ln(D/r') H/km B) 0.2ln(D/r') H/m

C) 2*10 -7ln(D/r') H/km D) 0.2ln(D/r) H/km

13.Most of the High voltage transmission lines in India is [ ]

A) Under Ground B) Overhead

C) Either of the above D) None

14. Over head lines generally use [ ]

A) Copper conductors B) All aluminium conductors

C) A.C.S.R conductors D) Hollow conductors

15. AAAC stands for [ ]

A) All aluminium alloy conductors B)Alloyaluminium all conductors

C)Aluminiumall alloy conductors D) All alloyAluminium conductors

16. The total diameter of stranded conductor can be determined by [ ]

A) (3n+1) B(2n+1)

C)(2n+1)d D)(2d-1)n

17. The power loss in an over head transmission line is mainly due to …… [ ]

A) Line conductor resistance B) Capacitance

C) Inductance D) Admittance

18. By increasing the transmission voltage to double of its original value the same power can be dispatched keeping the line loss [ ]

A) equal to its original value B) half of the original value

C) double the original value D) one fourth of the original value

19. In case of inductance The GMR is Equal to [ ]

A) 0.7788 B) Radius of the conductor

C) 0.7788*radius of the conductor D) 0.7788/radius of the conductor

20. The relation between flux density(B) and field intensity(H) is [ ]

A) H=εB B)B=μH

C) B=εH D) B=H

21. The unit of permittivity is [ ]

A)H/m B) F/m

C) Weber/m D) Weber/m^2

22. Skin effect depends on [ ]

(A)supply frequency (B) size of conductor

(C) Nature of material (D) All

23. ACSR conductor consist of a central core [ ]

(A)copper (B) steel

(C) stainless steel (D)cadmium

24. Highest transmission voltage in india is [ ]

(A) 500kv (B) 450kv

(C)765kv (D)400kv

25.The capacitance of a transmission line is a [ ]

(A) series element (B) shunt element

(C) neither series nor shunt element (D) none

26. The D.C resistance of conductor is less than A.C resistance due to [ ]

(A) skin effect (B) proximity effect

(C) both are correct (D)none of the above

27. Inductance is equal to [ ]

(A)flux/current (B) flux linkages/current

(C)EMF/flux (D) EMF/current

28. Units for susceptance is [ ]

A) ohm B) mhos

C) Farads D) Henrys

29.Charging current I_C = ……. [ ]

A) 2IIFCV B) IIfcv

C) 2IIfl D) none

30. The crowding of alternating current on the surface of a conductor known as [ ]

A) Ferrante effect B) Proximity effect

C) Skin effect D) Spirality effect

31. ACSR means _____ [ ]

A)Aluminum Conductor Steel Reinforced B) Aluminum Conductor super

C) Aluminum Carbo Steel Rainforced D) none of the above

32. In EHV lines _____ conductor are used. [ ]

A) Standard B) bundled

C) twisted D) none

33. The ratio of line to line capacitance and line to neutral capacitance is _____ [ ]

A) 1/2 B) 2/2

C) 3/2 D)2/3

34. The inductance of single phase two wire power transmission line per km gets doubled when the [ ]

(A)Distance between the wires is doubled.

(B)Distance between the wires is increased four fold

(C) Distance between the wires is increased as square of the original distance.

(D) Radius of the wire is doubled.

35. For a single phase overhead line having solid copper conductors of diameter 1cm spaced 60cm betweens centers, the inductance in mH/km is [ ]

(A) 0.05 + 0.2 log 60 (B) 0.2 logs 60

(C) 0.05 + 0.2 log 60/0.5 (D) 0.2 log 60/0.5

36. The inductance of a transmission line is minimum when [ ]

(A) GMD is high (B) GMR is high

(C) Both GMD and GMR are high (D) GMD is low and GMR is high

37. The self GMD of a conductor with three strands each of radius r and touching each other is [ ]

(A) $r(0.7788 \times 2 \times 2)^{1/3}$ (B) $r(0.7788 \times 2 \times 2)^{3}$

(C) $r(0.7788 \times 2 \times 2 \times 2)$ (D) $r(0.7788 \times 2 \times 2 \times 2)^{3}$

38. Which of the following is happened due to transposition of transmission line? [ ]

(A) Reduce line loss (B) reduce skin effect

(C) Balance line voltage drop (D) Reduce corona

39. Formula for capacitance of a 1-ϕ two wire transmission line per phase is [ ]

A) $2 \times 10^{-7} \log \frac{d}{r}$ B) $\frac{\pi \varepsilon_0}{\log \frac{D}{r}}$

C) $\frac{2\pi \varepsilon_0}{\log \frac{D}{r}}$ D) $D\, r^2$

40. Formula for internal flux linkages of a conductor for phase is [ ]

A) $\frac{\mu_0 \pi}{8I}$ B) $\frac{\mu_0 I}{8\pi}$

C) $\frac{\mu_0 D}{8\pi}$ D) $\frac{8\pi}{\mu_0 I}$

UNIT – II

PERFORMANCE OF TRANSMISSION LINES

1.310km is considered as [ ]

A) Long line B) Medium line

C) Short line D) Any of the above

2. Operating voltage in medium transmission line is [ ]

A) 100 KV B) 20-100 KV

C) 30-40 KV D) 60-100KV

3. If the length of the line is less than 80km then transmission line is [ ]

A) Medium line B) Short line

C) Long line D) All

4. Characteristic Impedance Z_c= [ ]

A) √Z/Y B) √Y/Z

C) √ZY D) √Z/L

5. Units of A is [ ]

A) Ohms B) Mhos

C) Farads D) No unit

6.In any transmission line, AD-BC = [ ]

A) -1 B) 1

C) 2 D) 0

7.In short transmission lines the effects of …….. are neglected [ ]

A) Capacitance B) Inductance

C) Resistance D) All

8. In any transmission lineAD-BC = …… [ ]

A) 0 B) 1

C) 2 D) -1

9. In transmission line generalized constants……and …… are equal [ ]

A) A and B B) A & C

C) B and C D) A & D

10. In medium transmission line effects of ……. are taken into account [ ]

A) Capacitance B) Inductance

C) Resistance D) Conductance

11. In medium transmission line the line constants are assumed as [ ]

A) Distributed B) Lumped

C) A & B D) None

12. The operating voltage in long transmission lines is [ ]

A) 10 KV B) 20-100KV

C) above 100 KV D) Above 150kv

13. The length of the short transmission line…. [ ]

A) above 200 km B) above 80 km

C) Upto 80 km D) 60-100km

14. In nominal T-method total capacitance concentrated at …….of the line [ ]

A) Sending end B) Middle

C) Receiving end D) All

15. Units of B is [ ]

A) No unit B) MHOS

C) OHMS D) Weber

16.In short transmission line sending end current I_r= [ ]

A) I_s B) -1

C) 0 D) None

17. Operating voltage in medium transmission line is [ ]

A) 100 KV B) 20-100 KV

C) 30-40 KV D)10KV-25KV5.

18. The dimension of constants'B'and 'C' respectively are [ ]

(A)ohm and mho (B)mho and ohm

(C)ohm and volt (D)volt and ohm

19. In transmission live generalized constants……and …… are equal [ ]

A) A and B B) A & C

C) B and C D) A & D

20. A 25km, 20 kv transmission line is consider as [ ]

A) Long B) Medium

C) Short D) None

21. For a medium length transmission line A is equal to [ ]

A) C B) B

C) A & B D) D

22. For a transmission line which one of the following is true [ ]

A) BC– AD = 1 B) AD-BC=1

C) AD-BC=-1 D) AD-BC = 0

23. A 220km, 110 kv transmission line consider as [ ]

A) Medium Tr.Line B) long tr.line

C) short Tr.Line D) None

24. In nominal – T method capacitance is concentrated in line is [ ]

A) Middle B) receiving end

C) Sending end D) none

25. Operating voltage of medium transmission line [ ]

A) 10-20 KV B) 100-200 KV

C) 200-100 KV D) All

26. For the solution of long transmission lines ……method is applicable [ ]

A) End condenser B) Nominal-T

C) Nominal-II D) rigorous method

27.The formula of Constant 'A' for medium transmission line is [ ]

(A) $1+\left[\frac{YZ}{2}\right]^2$ (B) Y

(C) $Z\left[1+\frac{YZ}{4}\right]$ (D) $1+\frac{YZ}{2}$

28.ABCD constants for cascade networks is [ ]

(A) $\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix} \begin{bmatrix} A & B \\ C_1 & D_1 \end{bmatrix}$

(B) $\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_1 & B_2 \\ C_1 & D_2 \end{bmatrix} \begin{bmatrix} A_2 & B_1 \\ C_2 & D_1 \end{bmatrix}$

(C) $\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix} \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix}$

(D) $\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_2 & B_1 \\ C_2 & D_1 \end{bmatrix} \begin{bmatrix} A_1 & B_2 \\ C_1 & D_2 \end{bmatrix}$

29.The expression for percentage regulation of transmission line is [ ]

(A) $\frac{VR-VS}{VR}\times 100$ (B) $\frac{VR-VS}{VS}\times 100$

(C) $\frac{VS-VR}{VR}\times 100$ (D) $\frac{VS-VR}{VS}\times 100$

30. As compared to sending end voltage, the receiving end voltage of a short line under no-load condition is [ ]

(A) higher (B) lower

(C) remains (D) zero

31.. The value of constant 'A' of a transmission line [ ]

(A) Increases with the increase in length of the line

(B) Decreases with the increase in line length

(C) is independent of line length

(D) all of the above

32. Surge impedance of a transmission line with negligible resistance is [ ]

(A) $\sqrt{\frac{L}{C}}$ (B) $\sqrt{\frac{C}{L}}$

(C) $\frac{1}{\sqrt{LC}}$ (D) $\sqrt{LC}$

33. Ferranti effect on long overhead lines is experienced when it is [ ]

(A) On full load 0.8p.f lag (B) for any p.f

(C) Lightly loaded (D) on full load at unity p.f

34. Which of the following is true for loss less line? [ ]

(A) L=0 (B) Z=0

(C) C=0 (D) R=0

35. The velocity of propagation of electromagnetic waves on overhead lines is [ ]

(A) 3×10^8m/s (B) 3×10^8km/s

(C) 3×10^8m/hour (D)3×10^8 km/hour

36. The condition for maximum power transfer is [ ]

(A) X=R (B) X = 2R

(C) X = $\sqrt{2}R$ (D) X = $\sqrt{3}R$

37. Transmission constant 'A' for a transmission line with resistance 'R', reactance 'X' and negligible capacitance is [ ]

(A) R+jX (B) 0

(C) R+X (D) 1

38. Galvanised steel wire is generally used as [ ]

(A)stay wire (B) earth wire

(C)structural components (D)all of the above

39. The square root of the ratio of line impedance and shunt admittance is called the [ ]

(A) surge impedance of the line (B) conductance of the line

(C) regulation of the line (D) none of the above

40. Distribution lines in India generally use [ ]

(A) wooden poles (B) R.C.C. poles

(C) steel towers (D) none of the above

UNIT – III

MECHANICAL DESIGN OF TRANSMISSION LINES

1. The insulating material most commonly used for power cables is [ ]

(A) PVC (B) Paper

(C) Rubber (D) Plastic

2. Irregularity factor 'm' for polished conductor is [ ]

(A) 1.0 (B) 0.98

(C) 0.72 (D) 1.5

3. The effect of ice deposition on conductor is to increase the [ ]

(A) Weight of the conductor (B) Transmission

(C) Resistance to flow of current (D) Skin effect

4. The formula for the air density correction factor δ is given by_____ [ ]

(A) $\frac{3 \cdot 92b}{273+t}$ (B) $\frac{3 \cdot 92t}{273+b}$

(C) $\frac{5 \cdot 92b}{273+t}$ (D) $\frac{3 \cdot 92g}{273+t}$

5. The sag of transmission line conductors in summer is [ ]

(A) Less than that in winter (B) Greater than in winter

(C) Same as in winter (D)None

6. The insulators may fail due to [ ]

(A) flash-over (B) short-circuits

(C) Deposition of dust (D) open-circuits

7. The phenomenon of corona is accompanied by_____ [ ]

(A) Hissing sound (B) production of ozone

(C) power loss (D) All

8. The power is transmitted at high voltages because it [ ]

(A) Reduces the generating cost (B) Increases the efficiency

(C) Is easy to transmit (D)Reduces the conductor cross section

9. Skin effect exists in [ ]

(A) AC transmission only (B) DC transmission only

(C) Both AC and DC (D)None

10. In pin type insulator petticoats are provided [ ]

(A) For good appearance (B)To the increases the length of leakage current path

(C)For protection against rain (D)None of the above

11. The disc diameter of stander insulator is [ ]

(A) 20.cm (B) 25.4c.m

(C) 30c.m (D) None

12. For short spans and voltages up to 33KV the following support is used [ ]

(A) Steel poles (B) Rein forced concrete poles

(C) Both (A) and (B) (D) None

13. For 132KV transmission the no. of insulators required [ ]

(A) 11 (B)12

(C)10 (D)15

14. Kelvin law is used to determine the following [ ]

(A)The most economical length of a feeder

(B) The most economical height of line supports

(C).The most economical size of a conductor in a distribution system

(D) The most economical insulation

15. Effect of increase in temperature in overhead transmission lines is to [ ]

(A) Increase the stress and length (B) Decrease the stress and length

(C) Decrease the stress but increase and length (D) None

16. For stability and economic reasons we operate the transmission line with power angle in the range [ ]

(A)10^0 to 25^0 (B) 30^0 to 45^0

(C) 60^0 to 75^0 (D) 65^0 to 80^0

17. Bundled conductors in EHV transmission systems provide [ ]

(A)Increase line reactance (B)Reduce line reactance

(C)Reduce voltage gradient (D)Increased corona loss

18. The design of insulation for above 400kv, is based upon [ ]

(A)Lightning over voltage (B)switching surges

(C)System voltage level (D)System load level

19. A string insulator has 4units. The voltage across the bottom most unit is 33.33% of the total voltage. Its string efficiency is [ ]

(A)25% (B)33.33%

(C)66.67% (D)75%

20. Whenever the conductors are dead ended or there is a change in the direction of transmission line, the insulators used are of the [ ]

(A)Pin type (B)Suspension type

(C)Shackle type (D)Strain type

21. For low voltage of order 11KV, which of the following insulators are used [ ]

(A) Pin (B) Shackle

(C) Suspension (D) Glass

22. The minimum clearance between the ground and a 220 kV line is about [ ]

(A) 4.3 m (B) 5.5 m

(C) 7.0 m (D) 10.5 m

23.The spacing between phase conductors of a 220 kV line is approximately equal to [ ]

(A) 2 m (B) 3.5 m

(C) 6 m (D) 8.5 m

24.The presence of ozone due to corona is harmful because it [ ]

(A) reduces power factor (B) corrodes the material

(C)gives odour (D)transfer energy to the ground

25. When a live conductor of public electric supply breaks down and touches the earth which of the following will happen ? [ ]

(A)Current will flow to earth (B)Supply voltage will drop

(C)Supply voltage will increase (D)No current will flow in the conductor

26. The skin effect of a conductor will reduce as the [ ]

(A) resistivity of conductor material increases

(B) permeability of conductor material increases

(C)diameter increases

(D)frequency increases

27. The following system is not generally used [ ]

(A) 1-phase 3 wire (B) 1-phase 4 wire

(C) 3-phase 3 wire (D) 3-phase 4 wire

28. For transmission of power over a distance of 500 km, the transmission voltage should be in the range [ ]

(A) 150 to 220 kV (B) 100 to 120 kV

(C) 60 to 100 kV (D) 20 to 50 kv

29. Corona usually occurs when the electrostatic stress in air around the conductor exceeds [ ]

(A)6.6 kV (r.m.s. value)/cm (B)11 kV (r.m.s. value)/cm

(C)22 kV (maximum value)/cm (D)30 kV (maximum value)/cm

30. In aluminium conductors, steel core is provided to [ ]

(A) compensate for skin effect (B) neutralise proximity effect

(C) reduce line inductance (D) increase the tensile strength

31. What is the primary consideration on deciding the conductor size of EHV lines? [ ]

(A) voltage drop (B) current density

(C) Corona (D) A&B

32.Stringing chart is useful for [ ]

(A) The design of tower (B) the design of insulator string

(C) finding the sag in the conductors (D) finding the distance between the towers

33. High voltage transmission efficiency is in the range of [ ]

(A) 30-45% (B) 55-70%

(C) 5-10% (D) 85-95%

34. Insulators are required to withstand [ ]

(A) mechanical stresses (B)electrical stresses

(C) A&B (D) None of the above

35. An insulator shoul have_____resistance [ ]

(A) Low (B) High

(C) Either High or Low (D)None

36.In a string of suspension insulators, the voltage across the line unit is [ ]

(A) Maximum (B) Minimum

(C) Zero (D) Equal to the line voltage

37.For a transmission line working at 110KV, the insulators used are [ ]

(A) Strain type (B) Suspension type

(C) pin type (D) shackle

38. Guard ring is used to [ ]

(A) Increase the potential across each unit (B) Equalize the potential across each unit

(C) Decrease the potential across each unit (D) None of the above

39. The discs of the strain insulators are used in

(A) Vertical plane only (B) Horizontal plane only

(C)Both the planes (D) None

40.The most commonly used material for insulators of over head lines is [ ]

(A) Porcelain (B) glass

(C) mica (D) PVC

UNIT – IV

PERFORMANCE OF TRANSMISSION LINES

1. Surge impedance of a transmission line with negligible resistance is [ ]

(A) $\sqrt{\frac{L}{C}}$ (B) $\sqrt{\frac{C}{L}}$

(C) $\frac{1}{\sqrt{LC}}$ (D) $\sqrt{LC}$

2. Coefficient of refraction of voltage wave for short circuited line is _____ [ ]

(A) Two (B) Zero

(C) One (D) None

3. For an open circuited transmission line, the reflection coefficient is_____ [ ]

(A) One (B) Two

(C) Zero (D) Three

4. The surge resistance of an over head line is about [ ]

(A) 200 ohms (B) 350 ohms

(C) 400 ohms (D) 40 ohms

5. The reflection coefficient for voltage wave in over head line is given as _____ [ ]

(A) $-\frac{R-Z}{R+Z}$ (B) R+Z

(C) . $\frac{R-Z}{R+Z}$ (D)None

6. If the line is terminated with surge impedance R=Z than coefficient of reflection of current is _____ [ ]

(A) One (B) Two

(C) Zero (D) None

7. The velocity of travelling wave through a cable of relative permittivity 9 is [ ]

(A)$9*10^8$m/s (B)$3*10^8$m/s

(C) 10^8m/s (D)$2*10^8$m/s

8. Coefficient of refraction of voltage wave for short circuited line is _____ [ ]

(A) Two (B) Zero

(C) One (D) None

9.For an open circuited transmission line, the reflection coefficient is_____ [ ]

(A) One (B) Two

(C) Zero (D) Three

10. The surge resistance of an over head line is about [ ]

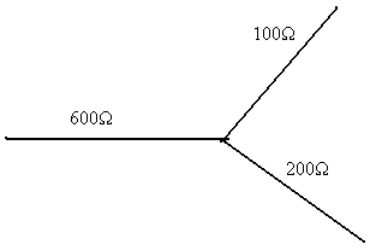
(A) 200 ohms (B) 350 ohms

(C) 400 ohms (D) 40 ohms

11. A surge of 100kv traveling in a line of natural impedance 600Ω arrives at junction with two lines of impedance 100 Ω and 200 Ω as shown in figure. The surge current in branch 3 is [ ]

(A) 210.2A (B) 106.8A

(C) 100A (D) 205.7A



12. The velocity of incident voltage in under ground cables is [ ]

(A) 5×10^8/E m/sec (B) 3×10^8 m/sec

(C) 3×10^8/E m/sec (D) $3\times10^8/\sqrt{E}$ m/sec

13. Which of following is true for an infinite length line? [ ]

(A) Coefficient of reflection of current=0

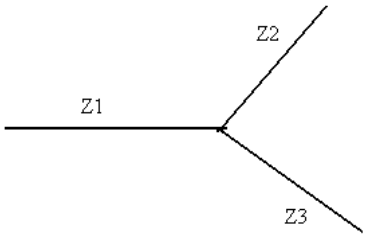
(B) Coefficient of refraction of current=0

(C) Coefficient of reflection of voltage=1

(D) Coefficient of refraction of voltage=0

14. A surge of V traveling in a line of natural impedance Z_1 arrives at a junction with two lines of impedances Z_2 and Z_3 as shown in figure.

The surge current transmitted in branch is [ ]



(A) $\frac{V}{Z1+Z2+Z3}$ (B) ZERO

(C) $\frac{2V}{Z1+Z2+Z3}$ (D) $\frac{V/Z1Z2}{\frac{1}{Z1}+\frac{1}{Z2}+\frac{1}{Z3}}$

15. The reflection coefficient for the voltage wave in overhead lines is [ ]

(A) R_0/R_0-R_L (B) R_L/R_0-R_L

(C) R_0-R_L / R_L-R_0 (D) R_L+R_0 / R_0-R_L

16. Formula for refracted wave is [ ]

(A) Incident wave + Reflected wave (B) Incident wave + Refracted wave

(C) Transmission wave + Refracted wave (D) only incident wave

17. Formula for coefficient of refraction for current wave when $R\rightarrow \infty$ is [ ]

(A) 1 (B) >1

(C) < 1 (D) zero

18. Which of the following is co-efficient of refraction for voltage wave when $R\rightarrow \infty$? [ ]

(A) 1 (B) > 1

(C) 2 (D) zero

19. Select the formula for co-efficient of reflection for current wave when $R\rightarrow \infty$ [ ]

(A) –1 (B) +1

(C) >1 (D) zero

20. Choose the formula for co-efficient of reflection for voltage wave when $R\rightarrow \infty$ [ ]

(A) –1 (B) +1

(C) >1 (D) zero

21. A surge of 260kv traveling in a line of natural impedance of 500 Ω arrives at the junction with two lines of natural impedances of 250 Ω &50 Ω respectively. The voltage transmitted in the branch lines is _____ [ ]

(A) 40KV (B) 30KV

(C) 20KV (D)10KV

22. The velocity of traveling wave through a cable of relative permittivity 16 is _____ [ ]

(A) (1×10^8)/4m/sec (B) (2×10^8)/4m/sec

(C)(3×10^8)/4m/sec (D) (4×10^8)/4m/sec

23. Coefficient of refraction of voltage wave for short circuited line is _____ [ ]

(A) two (B) Zero

(C) one (D)none

24. For a long transmission line, for a particular receiving end voltage, when sending end voltage is calculated. It is more than the actual value when calculated by_____ [ ]

(A) GMD method (B) Load end capacitance method

(C) corona (D) none

25. The self GMD method is used to calculate_____ [ ]

(A)Resistance (B) capacitance

(C) inductance (D) None

26. If the line is terminated with surge impedance R=Z than coefficient of reflection of current is _____ [ ]

(A) one (B) two

(C) zero (D) none

27. For an open circuited transmission line, the reflection coefficient is_____. [ ]

(A) one (B) two

(C) one (D)three

28. The reflection coefficient for current wave in over head line is given as _____ . [ ]

(A) $\frac{R-Z}{R+Z}$ (B) $-\frac{R-Z}{R+Z}$

(C) $\frac{R-Z}{R+Z}$ (D) $\frac{R-Z}{R+Z}$

29. The reflection coefficient for voltage wave in over head line is given as _____ . [ ]

(A) $-\frac{R-Z}{R+Z}$ (B)R+Z

(C) . $\frac{R-Z}{R+Z}$ (D)none

30. For an open circuited line the resulting current will be_____ [ ]

(A) one (B) two

(C) 3 (D)zero

31. The coefficient of reflection for current wave is [ ]

(A) -1 (B) 2

(C) 1 (D) 0

32. The surge impedance of a 400Km long overhead transmission line is 400Ω. For a 200Km length of the same line, the surge impedance will be [ ]

(A) 200Ω (B) 800Ω

(C) 400Ω (D) 100Ω

33. An overhead transmission line having surge impedance Z_1 is terminated to an underground cable of surge impedance Z_2 . The reflection coefficient for the travelling wave at the junction of the line and cable is [ ]

(A)Z_1+Z_2/Z_1+Z_2 (B) $Z_{2/}\ Z_1+Z_2$

(C) $Z_1-Z_{2/}\ Z_1+Z_2$ (D) $Z_2-Z_{1/}\ Z_1+Z_2$

34. Formula for incident wave is [ ]

(A) $\left|\frac{V_R+I_R z_c}{2}\right| e^{ax}\cos(\omega t+\beta x+Q_1)$ (B) $\sqrt{2}\left|\frac{V_R+I_R z_c}{2}\right| e^{-ax}\cos(\omega t+\beta x+Q_1)$

(C) $\sqrt{2}\left|\frac{V_R-I_R z_c}{2}\right| e^{+ax}\cos(\omega t+\beta x+Q_1)$ (D) $\sqrt{2}\left|\frac{V_R+I_R z_c}{2}\right| e^{ax}\cos(\omega t+\beta x+Q_1)$

35. Formula for reflected wave is [ ]

(A) $\left|\frac{V_R-I_R z_c}{2}\right| e^{ax}\sin(\omega t+\beta x+Q_2)$ (B) $\sqrt{2}\left|\frac{V_R-I_R z_c}{2}\right| e^{-ax}\sin(\omega t+\beta x+Q_2)$

(C) $\sqrt{2}\left|\frac{V_R-I_R z_c}{2}\right| e^{ax}\cos(\omega t-\beta x+Q_2)$ (D) $\sqrt{2}\left|\frac{V_R-I_R z_c}{2}\right| e^{ax}\cos(\omega t+\beta x+Q_1)$

36. The condition for maximum power transfer is [ ]

(A) X=R (B) X = 2R

(C) X = $\sqrt{2}R$ (D) X = $\sqrt{3}R$

37. The velocity of propagation of electromagnetic waves on overhead lines is [ ]

(A) 3×10^8m/s (B) 3×10^8km/s

(C) 3×10^8m/hour (D)3×10^8 km/hour

38. In AC.S.R. conductors, the insulation between aluminium and steel conductors is [ ]

(A) insulin (B) bitumen

(C) varnish (D)no insulation is required

39. Transmission voltage of ll kV is normally used for distances upto [ ]

(A) 20—25 k (B) 40—50 km

(C) 60—70 km (D) 80—100 km

40. Which of the following characteristics should the line supports fortransmission lines possess ? [ ]

(A)Low cost (B) High mechanical strength

(C)Longer life (D)All of the above

UNIT – V

CABLES

1. The insulating material most commonly used for power cables is [ ]

(A) PVC (B) Paper

(C) Rubber (D) Plastic

2. The electrostatic stress in a single core cable is_____ at the conductor surface [ ]

(A) High (B) Low

(C) Less (D) More

3. Which of the following protects the underground cables against mechanical injury? [ ]

(A) Armoring (B) Bending

(C) Sheath (D) All of these

4. The material commonly used for sheaths of underground cable is [ ]

(A) Copper (B) Lead

(C) Steel (D) Rubber

5. The insulating material for the cables should [ ]

(A) Be acid proof (B) Be non-inflammable

(C) Be non-hygroscopic (D) Non acid

6. Dielectric strength of rubber is around [ ]

(A) 5 kv/mm (B) 15 kv/mm

(C) 30 kv/mm (D) 200 kv/mm

7. If the length of a cable increases, its insulation resistance _____ [ ]

(A) Higher enough (B) Higher

(C) Lower (D) None

8. Cables generally used beyond 66kv are [ ]

(A) Oil filled (B) SL type

(C) Belted (D) Armored

9. High tension cables can be used up- to [ ]

(A) 22KV (B) 11KV

(C) 44KV (D) 33KV

10. The velocity of incident voltage in underground cables is [ ]

(A) 5×10^8/E m/sec (B) 3×10^8 m/sec

(C) 3×10^8/E m/sec (D) $3\times10^8/\sqrt{E}$ m/sec

11.The most commonly used insulation in high voltage cable is [ ]

(A) Impregnated (B) Rubber

(C) VIR (D) Cloth

12. In order to eliminate sheath losses, a successful method is [ ]

(A) to transpose the cable along with cross bonding

(B) transpose the cables only

(C) Corresponding the cables is enough

(D) None

13. The insulating material for a cable should have [ ]

(A) low cost (B) high dielectric strength

(C) high mechanical strength (D) all of the above

14. Which of the following insulation is used in cables ? [ ]

(A)Varnished cambric (B)Rubber

(C) Paper (D)Any of the above

15. Empire tape is [ ]

(A) varnished cambric (B) vulcanised rubber

(C) impregnated paper (D) none of the above

16. The thickness of the layer of insulation on the conductor, in cables, depends upon [ ]

(A) reactive power (B) power factor

(C) voltage (D) current carrying capacity

17. The bedding on a cable consists of [ ]

(A) hessian cloth (B) jute

(C) any of the above (D) none of the above

18. In a cable immediately above metallic sheath _____ is provided. [ ]

(A) earthing connection (B) bedding

(C) armouring (D) none of the above

19. The current carrying capacity of cables in D.C. is more than that in A.C.mainly due to [ ]

(A) absence of harmonics (B) non-existence of any stability limit

(C) smaller dielectric loss (D) absence of ripples

20. In case of three core flexible cable the colour of the neutral is [ ]

(A) blue (B) black

(C) brown (D) none of the above

21. cables are used for 132 kV lines. [ ]

(A) High tension (B) Super tension

(C) Extra high tension (D) Extra super voltage

22. Conduit pipes are normally used to protect _____ cables. [ ]

(A)unsheathed cables (B)armoured

(C)PVC sheathed cables (D)all of the above

23. The minimum dielectric stress in a cable is at [ ]

(A) armour (B) bedding

(C) conductor surface (D)lead sheath

24. In single core cables armouring is not done to [ ]

(A) avoid excessive sheath losses (B) make it flexible

(C) either of the above (D) none of the above

25. Low tension cables are generally used up to [ ]

(A) 200 V (B) 500 V

(C) 700 V (D) 1000 V

26. In a cable, the maximum stress under operating conditions is at [ ]

(A) insulation layer (B) sheath

(C) armour (D) conductor surface

27. The surge resistance of cable is [ ]

(A) 5 ohms (B) 20 ohms

(C) 50 ohms (D) 100 ohms

28. PVC stands for [ ]

(A) polyvinyl chloride (B) post varnish conductor

(C) pressed and varnished cloth (D) positive voltage conductor

29. In capacitance grading of cables we use a _____ dielectric. [ ]

(A) composite (B) porou

(C) homogeneous (D) hygroscopic

30. Pressure cables are generally not used beyond [ ]

(A) 11 kV (B) 33 kV

(C) 66 kV (D)132 kV

31. The material for armouring on cable is usually [ ]

(A) steel tape (B) galvanised steel wire

(C) any of the above (D)none of the above

32. If the length of a cable is doubled, its capacitance [ ]

(A) becomes one-fourth (B) becomes one-half

(C) becomes double (D) remains unchanged

33. In cables the charging current [ ]

(A)lags the voltage by 90° (B)leads the voltage by 90°

(C)lags the voltage by 180° (D) leads the voltage by 180°

34. A certain cable has an insulation of relative permittivity 4. If the insulation is replaced by one of relative permittivity 2, the capacitance of the cable will become [ ]

(A) one half (B) double

(C) four times (D) none of the above

35.If a cable of homogeneous insulation has a maximum stress of 10 kV/mm, then the dielectric strength of insulation should be [ ]

(A) 5 kV/mm (B) 10 kV/mm

(C) 15 kV/mm (D) 30 kV/mm

36. In the cables, sheaths are used to [ ]

(A) prevent the moisture from entering the cable (B) provide enough strength

(C) provide proper insulation (D)none of the above

37. The intersheaths in the cables are used to [ ]

(A) minimize the stress (B) avoid the requirement of good insulation

(C) provide proper stress distribution (D)none of the above

38. The electrostatic stress in underground cables is [ ]

(A) same at the conductor and the sheath

(B) minimum at the conductor and maximum at the sheath

(C) maximum at the conductor and minimum at the sheath

(D) zero at the conductor as well as on the sheath

39. The breakdown of insulation of the cable can be avoided economically by the use of [ ]

(A) inter-sheaths (B)insulating materials with different dielectric constants

(C) both (a) and (b) (D)none of the above

40. The insulation of the cable decreases with [ ]

(A) the increase in length of the insulation (B) the decrease in the length of the insulation

(C) either (a) or (b) (D) none of the above