VALLIAMMAI ENGINEERING COLLEGE
KATTANKULATHUR-603203
DEPARTMENT ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

SUBJECT CODE/NAME: EE2303-TRANSMISSION & DISTRIBUTION

YEAR / SEM : III / V

UNIT- I

INTRODUCTION

1. What is meant by power supply system?
2. What is meant by Transmission and Distribution system?
3. What are the different types of Power supply system?
4. What are the various components of power supply system?
5. What are the different types of power plants?
6. What are the different operating voltages used for generation, primary and secondary transmission in AC power supply systems in India?
7. Define – Feeder, distributor and service mains.
8. List the advantages of high voltage transmission.
9. State Kelvin's law.
10. What are the limitations of Kelvin's law?
11. Define – Break-even distance.
12. List the disadvantages of DC transmission.
13. List the different types of DC links.
14. Define – Short Circuit Ratio (SCR)
15. What are the limitations of high voltage transmission?
16. List the various types of distribution systems.
17. List the different types of distribution systems based on connection
18. What are the different components of a distribution system?
20. What are the limitations of HVDC system?
21. List the two merits of HVDC system
22. List the HVDC systems present and which are in operation in India.
23. List the applications of HVDC system.
24. List the advantages of EHVAC transmission system.
25. What is the need of load dispatch centres? Where are the LDC's available in Tamil Nadu?

PART-B

1.(i)Discuss various types of HVDC links. **(8)**
(ii)List out the main components of a HVDC system. **(8)**
2.(i) Draw and explain the structure of modern power systems with typical voltage levels. **(13)**
(ii)What is the highest voltage level available in India? **(3)**
3. (i).Explain the effect of high voltage on volume of copper and on efficiency. **(8)**
(ii) Explain why the transmission lines are 3 phase 3-wire circuits while distribution lines are 3 phase 4-wire circuits. **(8)**
4. (i) Draw the model power system with single line representation. Show its essential constituent sections. **(6)**
(ii) What are the AC transmission and distribution level voltages we have in India? **(4)**
(iii) What are the different kinds of DC links? Draw relevant diagrams. **(6)**
5. (i)Explain why EHV transmission is preferred? What are the problems involved in EHV AC transmission? **(8)**
(ii) With neat schematic, explain the principle of HVDC system operation. **(8)**
6. Explain about FACTS with neat diagram **(16)**
7. Explain TCSC and SVS systems **(16)**
8. Explain with neat diagram about STATCOM and UPFC **(16)**
9. (i) Compare EHVAC and HVDC transmission **(8)**
(ii) Explain the applications of HVDC transmission system **(8)**
10.Derive expressions for sag and tension in a power conductor strung between two supports at equal heights taking into account the wind and ice loadings also.
11. (b) A transmission line conductor at a river crossing is supported from two towers at a height of 50 and 80 metres above water level. The horizontal distance between the towers is 300 metres. If the tension in the conductor is 2000 kg, find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per metre = 0.844 kg. Derive the formula used.

UNIT- II
TRANSMISSION LINE PARAMETERS

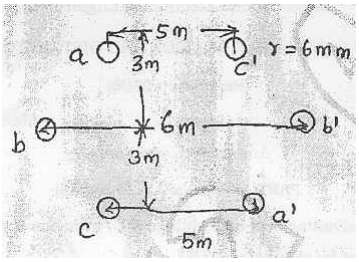
PART-A

1. Define Skin effect.
2. What is meant by proximity effect?
3. List out the advantages of double circuit lines.
4. Define - Self GMD (GMR) and mutual – G.M.D.
5. What is meant by inductive interference?
6. What is transposition of conductors?
7. State why transposition of line conductors are needed?
8. List the advantages of bundled conductors.
9. What are the factors that affect the skin effect?
10. Why the effective resistance is more than the static resistance of a transmission line?
11. Why does a transmission lines have resistance, inductance, and capacitance?
12. List the factors that governing the capacitance of a transmission line.

13. What is ACSR conductor?
14. What is fictitious conductor radius?
15. State the advantages of double circuit line over single circuit line.
16. Define unsymmetrical spacing.
17. Define symmetrical spacing.
18. Define capacitor.
19. What do you understand by inductive interference?

PART-B

1. From the fundamentals derive an expression for inductance of a single phase transmission system. **(16)**
2. Derive an expression for capacitances of a single phase transmission system and discuss the effect of earth on capacitance with suitable equation. **(16)**
3. (i) Derive an expression for inductance of a single-phase overhead line. **(8)**
   (ii) A conductor is composed of seven identical copper strands each having a radius r. Find the self-GMD of the conductor**.** **(8)**
4. i) Derive an expression for the capacitance between conductors of a single phase overhead line. **(8)**
   ii) Find the capacitance between the conductors of a single-phase 10 km long line. The diameter of each conductor is 1.213cm. The spacing between conductors is 1.25m. Also find the capacitance of each conductor neutral. **(8)**
5. i) Derive the expression for inductance of a two wire 1Φ transmission line **(8)**
   ii) Derive the expression for capacitance of a 1Φ transmission line **(8)**
6. i)What are the advantages of bundled conductors? **(4)**
   ii) Derive the expression for capacitance of a double circuit line for hexagonal spacing. **(8)**
   iii) Why is the concept of self GMD is not applicable for capacitance? **(4)**
7. i) Explain clearly the skin effect and the proximity effects when referred to overhead lines. **(8)**
   ii) Write a short note on the inductive interference between power and communication lines. **(8)**
8. i) Derive the expression for the capacitance per phase of the 3 Φ double circuit line flat vertical spacing with transposition. **(8)**
   ii) A 3 Φ overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2m side. Calculate the capacitance of each line conductor per km. Given the diameter of each conductor is 1.25cm. **(8)**
9. Find the capacitance per km per phase of a 3Φ line arrangement in a horizontal plane spaced 8 metres apart. The height of all conductors above the earth is 13 metres. The diameter of each conductor is 2.6 cm. the line is completely transposed and takes the effect of ground into account. **(16)**
10. Discuss the concept of GMR and GMD in the calculation of transmission line inductance.
11. Find the inductance per phase per km of double circuit 3 phase line shown in Fig. (11). The line is completely transposed and operates at a frequency of 50 Hz. (16)



UNIT- III

MODELLING AND PERFORMANCE OF TRANSMISSION LINES

PART- A (2 MARKS)

1. Classify overhead transmission lines.
2. Define transmission efficiency.
3. What is a transmission line?
4. List out the common methods of representation of medium transmission lines.
5. Define regulation of power transmission line.
6. What is tuned power line?
7. What is surge impedance loading or natural loading?
8. What are the voltages regulating equipments used in transmission systems?
9. What is attenuation in a power transmission line?
10. What are the units of generalized constants of a transmission line?
11. What is the range of surge impedance for an overhead transmission line?
12. What is a power circle diagram?
13. What is meant by the receiving end power circle diagram?
14. What is Ferranti effect?
15. What is the cause of Ferranti effect?
16. Define corona.
17. What is local corona?
18. Define critical disruptive voltage.
19. What are the methods adopted to reduce corona?
20. Is there any advantage on corona?
21. What is the use of power circle diagram?
22. What are the causes of voltage drop and line loss in a transmission line?
23. What are the advantages of using series compensation?
24. What are the main disadvantages of corona?
25. Define sag.
26. What is stringing chart?
27. What are the uses of stringing chart?
28. What are the factors which govern the performance of a transmission line?
29. What is the reason for sag in transmission line?

PART-B

1. Determine the efficiency and regulation of a 3phase, 100Km, 50 Hz transmission line delivering 20 MW at a power factor of 0.8 lagging and 66 kV to a balanced load. The conductors are of copper, each having resistance
   0.1 Ω / Km, 1.5 cm outside dia, spaced equilaterally 2 metres between centres. Use nominal T method. **(16)**
2. A three phase 5 km long transmission line, having resistance of 0.5 Ω / km and inductance of 1.76mH/km is delivering power at 0.8 pf lagging. The receiving end voltage is 32kV. If the supply end voltage is 33 kV, 50 Hz, find line current, regulation and efficiency of the transmission line. **(16)**

3. Derive the expressions for sending end voltage in nominal T method and end Condenser method. **(16)** 4. i)
What is an equivalent π circuit of long line? Derive expression for parameters of this circuit in terms of line parameters. **(8)** ii)
A 50Hz transmission line 300 km long total series impedance of 40+j25 Ω and total shunt admittance of 10 mho. The 220 Kv with 0.8 lagging power factor. Find the sending end voltage, current, power and power factor using nominal π method.**(8)**
5. i) Define regulation of a transmission line and derive the approximate expression for the regulation of a short transmission line. **(8)**
ii) What is corona loss? How do you determine this loss? **(8)**
6. A 220kV, 3Φ transmission line has an impedance per phase of (40+j200)Ω and an admittance of (0+j0.0015) mho. Determine the sending end voltage and sending end current when the receiving end current is 200 A at 0.95 pf lagging. Use nominal T method. **(16)**
7. Determine the efficiency and regulation of a three phase 200 km, 50Hz transmission line delivering 100MW at a pf of 0.8 lagging and 33kV to a balanced load. The conductors are of copper, each having resistance 0.1 Ω/km, and 1.5cm outside dia, spaced equilaterally 2m between centres. Neglect leakage reactance and use nominal
T and π methods. **(16)**
8. i) Explain the Ferranti effect with a phasor diagram and its causes. **(6)**
ii) Explain the classification of lines based on their length of transmission**.** **(4)**
iii) What are ABCD constants. **(6)**

9. A 15 km long overhead line delivers 5 MW at 11 kV at 0.8 pf lag line loss is 12% of power delivered. Line inductance is 1.1 mH per km per phase. Find the sending end Voltage and regulation. (16)
10. a) Explain the surge impedance loading with respect to an overhead transmission line. (8)
b) Explain the end condenser method for medium transmission line. (8)

UNIT- IV

INSULATORS AND CABLES

PART- A (2 MARKS)

1. What is the purpose of insulator?
2. What are the important characteristics that an overhead line insulator must provide?
3. What are the materials used for overhead line insulators?
4. List out various types of insulators used for overhead transmission lines.
5. Mention the advantages of the pin type insulator.
6. What are the main causes for failure of insulators?
7. What are the different tests that are conducted on an insulator?
8. List the properties of insulators?
9. Dfine capacitance grading?
10. Define inter sheath gradin.
11. State the advantage of series compensation?
12. Explain the necessity of reactive power in the system?
13. Define thermal resistance?

14. Write short notes on puncture test.
15. Define string efficiency?
16. What are the routine tests conducted on insulators?
17. What are the performance tests conducted on insulators?
18. What are the merits of under ground cables?
19. What is meant by efficiency of an insulator string?
20. What is the main purpose of bedding?
21. What are the common materials used for insulation?
22. What is the main purpose of armouring?
23. What is serving?
24. What is dielectric stress?
25. What is grading of cables?
26. What are the main advantages of suspension type insulators over pin type ones?
27. What are the methods for improving string efficiency?
28. Name the two methods of locating cable faults.
29. State two types of faults in a cable.
30. What is a power circle diagram?

PART-B

1. Discuss any two methods to increase the value of string efficiency, with suitable sketches. **(16)**
2. Explain any two methods of grading of cables with necessary diagrams. **(16)**
3. i) What are different methods to improve string efficiency of an insulator? **(8)**
   ii) In a 3-unit insulator, the joint to tower capacitance is 20% of the capacitance of each unit. By how much should the capacitance of the lowest unit be increased to get a string efficiency of 90%. The remaining two units are left unchanged. **(8)**
4. i) Derive the expression for insulator resistance, capacitance and electric stress in a single core cable. Where is the stress maximum and minimum? **(8)**
   ii) A single core 66kv cable working on 3-phase system has a conductor diameter of 2cm and sheath of inside diameter 5.3cm. If two inner sheaths are introduced in such a way that the stress varies between the same maximum and minimum in the three layers find:
   a) position of inner sheaths
   b) voltage on the linear sheaths
   c) maximum and minimum stress **(8)**
5. i) Draw the schematic diagram of a pin type insulator and explain its function **(8)**
   ii) A 3 phase overhead transmission line is being supported by three disc insulators. The potential across top unit (i.e. near the tower) and the middle unit are 8kV and 11kV respectively. Calculate,
   a) The ratio of capacitance between pin and earth to the self capacitance of each unit **(4)**
   b) Line Voltage **(2)**
   c) String Efficiency **(2)**

6.i) Describe with the neat sketch, the construction of a 3 core belted type cable**. (8)**

ii) A conductor of 1cm diameter passes centrally through porcelain cylinder of internal diameter 2 cms and external diameter 7cms. The cylinder is surrounded by a tightly fitting metal sheath. The permittivity of porcelain is 5 and the peak voltage gradient in air must not exceed 34kV/cm. Determine the maximum safe working voltage. **(8)**

7.i) What are the various properties of insulators? Also briefly explain about suspension type insulators. **(8)**

ii) Calculate the most economical diameter of a single core cable to be used on 132kV, 3 phase system. Find also the overall diameter of the insulation, if the peak permissible stress does not exceed 60kV/cm. Also derive the formula used. **(8)**

8. i) Briefly explain about various types of cables used in underground system. **(8)**

ii) A string of 4 insulator units has a self capacitance equal to 4 times the pin to earth capacitance. Calculate,

a) Voltage distribution as a % of total voltage
b) String efficiency **(8)**

9. i) Give any six properties of a good insulator. **(4)**

ii) With a neat diagram, explain the strain and stay insulators. **(4)**

iii) A cable is graded with three dielectrics of permittivities 4,3 and 2. The maximum permissible potential gradient for all dielectrics is same and equal to 30 kV/cm. The core diameter is 1.5cm and sheath diameter is 5.5cm. **(8)**

10.i) Explain the constructional features of one LT and HT cable **(8)**

ii) Compare and contrast overhead lines and underground cables. **(8)**

11.Explai the thermal characteristics of insulators and cables

UNIT- V

SUBSTATION GROUNDING SYSTEM AND DISTRIBUTION SYSTEM

PART- A (2 MARKS)

1.Define feder.
2. What are the conditions of laying out a substation?
3. What are the classifications of substation according to service?
4. What are the types of transformer substations?
5. What are the classifications of substations due to construction?
6.What are the equipments used in a transformer substation?
7.What are the different types of bus bar arrangements in substations?
8. What are the materials mainly used in busbars?
9. What are the factors to be considered for busbar design?
10. Which tests are necessary on station busbars?
11 What is neutral grounding or neutral earthing?
12. What is equipment grounding?
13. What are the advantages of neutral grounding?
14. What is earth resistance?
15. What are the devices used for DC power at the substation by using converting machinery?

16. Define distribution substation.
17. Define service mains?
18. What are the types of nature of current in distribution system?
19. State the function of circuit breaker?
20. List the various substation equipments.
21. Based on what criteria the substation bus schemes are chosen?
22. What are the advantages of ring main distributor?
23. Mention any two significance of neutral grounding?

PART-B

1. With a neat sketch explain double bus with double breaker and double bus with single breaker. State their advantages and disadvantages. **(16)**

2. Explain the following:
   (i) Neutral grounding
   (ii) Resistance grounding. **(16)**

3. Explain about the various types of substations **(16)**

4. Write short notes on
   I. Sub mains **(4)**
   II. Stepped and tapered mains

(12) 5. Explain the substation bus schemes. **(16)**

6. Write short notes on
   i. Busbar arrangement in substation **(8)**
   ii. Grounding grids **(8)**

7. i) Explain the design principles of substation grounding system. **(8)**
   ii) Explain the equipments in a transformer substation. **(8)**

8. Describe any four types of substation bus schemes. (16)

9. With the neat layout explain the design of modern substation with all protecting devices.

10. Discuss briefly each of the following
    i) Feedres ii)Radial Distribution iii)Ring main distribution