# ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

*Time Allowed: 2.5 Hours*                                    *Full Marks: 60*

**Answer to Question No. 1 of Group A must be written in the main answer script. In Question No. 1, out of 2 marks for each MCQ, 1 mark is allotted for right answer and 1 mark is allotted for correct explanation of the answer.**
**Answer any Five (05) Questions from Group-B.**

## GROUP-A

1. Choose the correct answer from the given alternatives and explain your answer (any ten):      2x10=20

I.      Skin effect is observed in
        a) DC system   b) AC system     c) Both AC & DC system   d) None of the above

II.     Which law determines the economic size of conductor? —
        (a) Lenz's law
        (b) Kelvin's law
        (c) Norton's law
        (d) None Of these.

III.    The most commonly adapted Power Generation Voltage is :-
        a)  220 V   b) 11kV   c) 132kV   d) 400kV

IV. In aluminium conductor steel core is provided to
        a) Compensate the skin effect   b) Neutralise proximity effect  c) Reduce line inductance  d) Increase the tensile strength

V. Suspension type insulators are used for Voltages beyond —
        (a) 33 kV
        (b) 400 kV
        (c) 11 kV
        (d) 66 kV.

VI. Primary distribution voltage level is
        a)   440 V    b) 66 KV     c) 132 KV    d) 11 KV

VII. In monopolar HVDC link, return path is provided by:-
a)  return conductor  b) earth   c) return path not required    d) neutral conductor

VIII.  Extra High Voltage _____ efficiency of transmission line.
a)  increases    b) decreases    c) does not affect  d) Can't be determined.

IX. Corona effects depends on
        a)  Atmosphere   b) Conductor size    c) Spacing between the conductor  d) All of the above

X.      Transposition of transmission line is done to
        (a) Reduce corona
        (b) Reduce skin effect
        (c) Reduce proximity effect
        (d) Balance line voltage drop

XI.     A 3 phase 4-wire system is commonly used in
        a) Primary transmission b) Secondary distribution c) Secondary transmission d) Primary distribution

XII. High voltage transmission line use
   a) Suspension insulator  b) Pin insulator  c) Guy insulator  d) All of the above

XIII. Which of the following feeder scheme has most reliability?
a) Radial   b) Parallel   c) Loop   d) Interconnected Network

XIV. Power factor of a system falls due to
   a) Resistive load  b) Capacitive load  c) High Voltage  d) Inductive load

XV. String efficiency falls below 1 due to
   a) Earth capacitance  b) Self capacitance of insulators  c) Self inductance of insulator   d) None of the above

## GROUP-B
### Answer any Five (05) questions.

2. a) Draw the single line diagram of a typical AC Electric power system.
b) Define Feeder and Distributor of an ac Distribution system.                    (4+2+2)

3. An overhead 3-phase short transmission line delivers 5 MW at 22kV at 0.8 lagging power factor. The resistance and reactance of each conductor is 4 Ω and 6 Ω respectively. Determine i) sending end voltage, ii) percentage regulation  iii) total line losses   and iv) transmission efficiency.                    (2+2+2+2)

4. a) State and prove Kelvin's law regarding economic size of conductor for transmission lines.
(b) What are the limitations of Kelvin's law?                    (2+3+3)

5. a) A single phase a.c. distributor AB 300 metres long is fed from end A and is loaded as under: (i) 100 Amp at 0.707 p.f. lagging, 200m from point A, (ii) 200 Amp at 0.8 p.f. lagging, 300m from point A. The load resistance and reactance of the distributor is 0.2 Ω/km and 0.1 Ω/km. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end.
   (b)  What types of line supports are used in transmission lines?                    (6+2)

6. a) A 3-phase over-head transmission line is being supported by three-disc insulators. The potential across top unit (i.e. near to the tower) and middle unit are 8kV and 11kV 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.
b) Name the methods of improving efficiency of string insulator.                    (6+2)

7. a) Compare overhead and underground distribution system.
   b) Explain in brief the radial and ring main type ac distribution system with diagram.                    (4+2+2)

8. a) What are the causes of low power factor in a system?  https://www.wbscteonline.com
b) State some of the effects of low power factor.
c) How power factor of a system can be improved?                    (2+3+3)

9. a) An overhead transmission line has a span of 200 meters, the line conductor weighs 0.7 kg per meter. Calculate the maximum sag if the maximum allowable tension in the line is 1400kg.
   b) Write different types of conductor materials used in overhead lines.                    (4+4)

10. a) Draw the equivalent circuit diagram of a medium transmission line using Nominal T method.
    b) Draw the phasor diagram of above and derive the sending end voltage and current from the phasor diagram.                    (2+6)

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