(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2113 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2012-13

ELEMENTS OF POWER SYSTEM

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions.

1. Attempt any **four** parts : **(5×4=20)**

   (a) Draw and explain the layout of a power system network from generation to distribution showing all the voltage levels at various intermediate stages.

   (b) Explain in short the following components of power system :

   (i) Sub station

   (ii) Feeder

   (iii) Distributor

   (iv) Service mains

   (v) Tie line.

   (c) State and prove Kelvin's law for size of conductor for transmission. Discuss its limitations.

   (d) In reference to the ac conductors explain the difference between skin effect and proximity effect. What remedy can be suggested to reduce both these effects ?

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   (d) In reference to the ac conductors explain the difference between skin effect and proximity effect. What remedy can be suggested to reduce both these effects ?

(e) Explain in brief various types of conductors with one advantage of each type.

(f) Explain how Bundled Conductors are superior than Solid or Stranded Conductors.

2. Attempt any **two** parts : **(10×2=20)**

(a) Deduce an expression for line to neutral capacitance for a 3-ϕ overhead transmission line when the conductors are :

(i) Symmetrically placed

(ii) Unsymmetrically placed but transposed.

(b) A 50 Hz, 3-ϕ, 275 kV, 400 km transmission line has the following parameters (per phase) :

Resistance = 0.035 Ω/km, L = 1 mH/km

C = 0.01 μF/km.

If the line is supplied at 275 kV, determine the MVA rating of a shunt reactor having negligible losses that would be required to maintain 275 kV at the receiving end, when the line is delivering no load. Use nominal π method.

(c) A 3-ϕ, 132 kV, 100 km, 50 Hz single circuit line has horizontal spacing with 3.5 m between adjacent conductors. The conductors diameter is 1.2 m. Find :

(i) Inductance of the conductor

(ii) Capacitance per phase and charging current with effect of earth.

3. Attempt any **two** parts : **(10×2=20)**

(a) A particular 3-ϕ transmission line has total corona loss of 57 kW at 110 kV and corona loss of 99 kW at 114.8 kV. Calculate the critical disruptive voltage per phase and corona loss at 120 kV.

(b) Write short notes on :

(i) Critical Disruptive Voltage

(ii) Audible Visual Corona

(iii) Necessity of Insulators.

(c) (i) An insulator string consists of three units, each having a safe working voltage of 20 kV, the ratio of self to shunt capacitance is 6 : 1. Find the maximum safe working voltage of the string and the string efficiency.

(ii) A string insulator has 4 units and each unit of string is having capacitance 'C' the pin to earth is C/10, find voltages across each unit of string.

4. Attempt any **two** parts : **(10×2=20)**

(a) (i) Derive the expressions of sag and tension when supports are at unequal level.

(ii) A transmission line has a span of 275 m between level supports the conductor has an effective diameter of 1.96 cm and weight 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm^2 of projected area, calculate sag for a safety factor of 2, weight of 1cc of it is 0.91 gm.

(b) Define dielectric stress in a single core cable. A cable is graded with three dielectrics of permitivities 4, 3 and 2. The maximum permissible potential gradient for all dielectrics is same and equals to 30 kV/cm. The core diameter is 1.5 cm and sheath diameter is 5.5 cm. Find the working voltage of cable.

(c) Write in brief on any **two** :

(i) Vibration dampers, stringing chart

(ii) Methods of grading of cable

(iii) Flashover and Puncture voltage in insulator.

5. Attempt any **two** parts : **(10×2=20)**

(a) What is grounding ? Why is earthing necessary ? Give various advantages of grounding.

(b) (i) Differentiate between various types of grounding.

(ii) Explain the problems associated with EHVAC transmission in detail.

(c) (i) What is the principle of operation of an HVDC transmission line ?

(ii) Define the following :

(a) Surge impedance loading

(b) Types of DC link.