B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

ELEMENTS OF POWER SYSTEM

Time : 3 Hours   *Total Marks : 100*

Note : Attempt **all** questions.

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

    (a) What are the factors which are responsible for the presence of skin effect in A.C. Transmission ? Suggest some measures to reduce it.

    (b) Bring out the relative advantages and disadvantages of overhead and underground systems.

    (c) Derive expressions for calculating the economic voltage and economic conductor cross section of a line. Comment on the results.

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

    (a) Describe the methods of images for the calculation of capacitance of a line. Derive the expression for the inductance per meter length of a 3-phase composite conductor line.

(b) A 3-phase 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 cm. Find the line capacitance per phase and the charging current per phase

(i) without effect of earth

(ii) with effect of earth.

(c) A 3-phase, 50 Hz line has a resistance of 80 ohm and a reactance of 11 ohm. It supplies a 8 lagging pf load at a voltage of 11 kV. Find the load at which the source-end voltage equals the load-end voltage when a 25 µf capacitor is connected across the load in each phase.

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

(a) Draw a phasor diagram of a nominal π transmission line finding out its A, B, C, D constants.

(b) Define the following :

(i) Critical disruptive voltage

(ii) Flashouer and puncture voltage

(iii) Visual critical disruptive voltage.

(c) Compare all the types of insulators. A string insulator has 4 units and each unit of the string is having capacitance "C" the pin to earth capacitance is C/10 find the voltages across each unit of the string and string efficiency.

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

   (a) An overhead stranded galvanized steel conductor has a 183 span. The conductor has 37 strands each of .259 cm diameter. The weight of conductor is 7.15 N/m and the breaking strength is 67700 N. The factor of safety should be 2.5. Calculate the sag under ice and wind condition if the radial thickness of ice is 0.96 cm and the wind load is 382 N/m^2 of projected area (coated with ice). The weight of ice is 8920 N/m^3.

   (b) Explain the concept of grading in the underground cable. Derive the expression for dielectric loss and dielectric power factor.

   (c) A-2-km long 3-core, 3-phase cable has capacitance 0.5 µF/Km between two conductors bunched with sheath and the third conductor the capacitance between the conductors is also measured when bunched together and the sheath and found to be .75 µF/Km. Determine :

   (i) Capacitance between phases

   (ii) Capacitance between conductor and sheath

   (iii) Effective per phase capacitance

   (iv) Capacitance between two conductors connecting a third conductor to the sheath.

   (v) Charging current if the supply voltage is 11 kV, 50 Hz.

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

   (a) Write short notes on :

       (i) audible noise and radio interference

       (ii) effect of wind and ice loading on the mechanical design of a line.

   (b) Compare EHV a.c and HVDC system in detail.

   (c) Classify various methods of neutral grounding explain any one of them.